FOODBORNE AND WATERBORNE DISEASE OUTBREAK INVESTIGATION MANUAL

Wisconsin Division of Health
Department of Health and Family Services
Bureau of Public Health
Communicable Disease Section

"When an outbreak or epidemic occurs, the local health officers shall immediately report to the department, and shall at all times keep the department informed of the prevalence of the communicable diseases in the locality in the manner and with the facts the department requires." **Wisconsin State Statute 252.05**

POH 4722 (Rev 4/98)

Guidelines for Reporting Suspected Outbreak-related Illnesses

If an individual is suspected of having a foodborne illness, the health care provider should:

1. **Collect clinical samples for laboratory analysis:**
   (Specimens from up to **10** persons in a suspected outbreak can be tested at the WSLH on a fee-exempt basis)
   - stool
   - vomitus

   If suspected food item(s) are available, instruct the individual not to ingest or discard food, but to keep it refrigerated. Arrangements will be made to collect and analyze the food samples pending further investigation. Arrangements must be made for the LHD to collect and hold the food items under refrigeration. Questions regarding sample collecting/testing should be directed to the Wisconsin State Laboratory of Hygiene, Microbiology Unit (608 / 262-1616).
2. **Inquire whether there are other ill persons.***
3. **Contact the Communicable Disease Program (608 / 267-7321) and/or your Regional Office.**
   Please provide the following information:
   - Brief description of situation
   - Names of ill persons
   - Address, telephone number
   - Age, sex
   - Onset of symptoms (date, time)
   - Description of symptoms
   - Samples collected
   - Treatment/medication(s)
   - Hospitalization status
   - Other available information (other ill persons, possible food sources, etc.)
   - Name of physician (if different than reporter), address, telephone number
4. **Start a line list.**

*** Definition of Foodborne Outbreak:**

2 or more persons experience a similar illness after ingestion of a common food

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Acknowledgments

This manual was developed with the input and assistance of the following: Wisconsin Division of Health, Bureau of Public Health, Communicable Disease Section (Mary Proctor, Jim Kazmierczak, Tom Haupt, John Archer, Mary Jo Trepka and Pam Hazlett), Environmental Epidemiolology Prevention Section (Edward Rabotski, Liz Temple and Paul Claflin - Environmental Sanitation Unit, Linda Knobeloch - Health Hazard Evaluation Unit), Department of Agriculture Trade and Consumer Protection (Mike Barnett and Wayne Kopp - Division of Food Safety); Wisconsin State Laboratory of Hygiene (Marjorie Hamacher and Linda Kelly - Microbiology Section, Jon Standridge and Sharon Kluender - Environmental Science Section, Carol Kirk - Virology Section); and Wisconsin Department of Natural Resources (Don Swailes - Water Supply); Madison Department of Public Health - Greg Pallaske. The 1997 *FOODBORNE AND WATERBORNE DISEASE OUTBREAK INVESTIGATION MANUAL* has been upgraded and revised to replace the December 1994 version. Please discard all old versions. Questions and comments regarding this manual should be directed to John Archer, Epidemiologist, Communicable Disease Section,
(608) 267-9009.

Report forms and worksheets

This manual contains the most current versions of all foodborne and waterborne disease forms and worksheets. With the exception of the Acute and Communicable Diseases Case Report form (DOH 4151), which can be obtained from the Bureau of Public Health, Communicable Disease Section, all forms and worksheets may be photocopied from this manual as needed.

I. INTRODUCTION AND BACKGROUND

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Foodborne and waterborne disease outbreaks are of urgent public health importance and immediate reporting of these diseases or outbreaks by physicians, laboratory directors and other public private health care providers to local health departments is mandated by Wisconsin law (Statute Chapter 252 COMMUNICABLE DISEASES). The public depends on health departments and food regulators for protection from foodborne illness. Such protection relies on rapid detection of outbreaks, determination of the cause of the outbreak, and institution of control measures to protect the public.

Careful investigation of foodborne and waterborne outbreaks is essential for disease control and prevention. Several key questions need to be addressed to determine the most effective control measures. What is the extent of the illness and who was affected? When and where did the critical exposure take place? What was the vehicle or how was the disease transmitted? What is the etiologic agent? Investigations of foodborne and waterborne outbreaks should proceed scientifically and professionally and not in reaction to the media or political pressures.

Much has been learned about the etiology, clinical characteristics and risk factors of gastrointestinal diseases as a result of careful investigations of foodborne and waterborne disease outbreaks. The quality of the data in a foodborne or waterborne disease outbreak investigation depends on the commitment to surveillance by local and state health staff. A local health department's interest in outbreak investigations and it's investigative capabilities are important determinants in the quality of the investigation.

Investigation of food and waterborne disease outbreaks are rarely, if ever, accomplished by a single individual. A proper investigation generally requires the effort of a team of several individuals with different areas of expertise. This manual is intended to provide a structure for coordinating the activities of the various public health, laboratory and administrative agencies responsible for the investigation, prevention, and control of food and waterborne disease in Wisconsin.

A. List of agency abbreviations:

BCD	Bureau of Communicable Diseases
BQA	Bureau of Quality Assurance
CDC	Centers for Disease Control and Prevention
CDES	Communicable Disease Epidemiology Section
DATCP	Department of Agriculture, Trade and Consumer Protection
DHFS	Department of Health and Family Services
DPH	Division of Public Health
DPI	Department of Public Instruction
EEPS	Environmental Epidemiology Prevention Section, BPH, DOH
ESU	Environmental Sanitation Unit, EEPS
FDA	U.S. Food and Drug Administration
LHD	Local Health Department
WDNR	Wisconsin Department of Natural Resources
WSLH	Wisconsin State Laboratory of Hygiene

B. Definitions of terms

Attack Rate: A type of cumulative incidence rate which expresses the occurrence of a disease among a specific population at risk observed for a limited period of time, often due to a very specific exposure.

Carrier: A person or animal that harbors a specific infectious agent, is asymptomatic, and is a potential source of infection for man or animals.

Case-control study: A type of observational analytic study. Enrollment into the study is based on presence ("case") or absence ("control") of disease. Characteristics such as previous exposures are then compared between cases and controls.

Case definition: A set of criteria used for investigative purposes to decide whether a person has a particular disease or whether a person is to be included in a "case" category by specifying clinical and laboratory criteria and by specifying limitations on time, place and person.

Cohort study: A type of observational analytic study. Enrollment in the study is based on exposure characteristics or membership in a group. Disease, death of other health-related outcomes are then ascertained and compared.

Common source outbreak: An outbreak that results from a group of persons being exposed to an infectious agent or toxin from a single source.

Confirmed case: A case with a laboratory-identified etiology.

Contact: Exposure to a source of an infection, or a person so exposed.

Epidemic: The occurrence of more cases of disease than expected in a given area or among a specific group of people during a particular period of time.

Epidemic curve (Epi curve): A histogram that shows the course of a disease outbreak by plotting the number of cases by time of onset.

Epidemiology: The study of the distribution and determinants of health-related states or events in specified populations, and the application of this study to the control of health problems.

Foodborne outbreak (FBO): A FBO is the occurrence of two or more cases of a similar illness resulting from the ingestion of a common food. (Prior to 1992 only one case of botulism or marine or chemical intoxication was required to constitute a FBO; since 1992, two or more cases are now required for these diseases to be defined as an outbreak.)

High risk group: A group in the community with an elevated risk for a particular disease.

Host: A person or other living organism that can be infected by an infectious agent under natural conditions.

Host factors: An intrinsic factor (age, sex, race, behaviors, etc.) which influences an individual's exposure, susceptibility, or response to a causative agent.

Incidence rate: The measure of frequency of new cases of a particular disease in a population during a specified period of time.

Incubation period: The period of time between exposure to an infectious agent and the onset of signs and symptoms of disease.

Index case: The first case among a number of similar cases which are epidemiologically related.

Line list: A table listing case names, age, sex, onset time, residence, symptoms, employment, etc. which facilitates comparisons of many characteristics for possible similarities or associations.

Morbidity: Any departure from a state of physiological or psychological well-being.

Onset: The time the first clinical signs or symptoms begin to occur.

Outbreak: Same as epidemic. Often the preferred word, as it may avoid the sensationalism associated with the word epidemic.

Prevalence: The number or proportion of cases or events or conditions in a given population.

Prevalence rate: The measure of frequency of all current cases of a particular disease, regardless of the time of onset, within a particular population either at a specified instant or during a specified period of time.

Probable case: A case without laboratory confirmation that has typical clinical features of the particular disease under investigation without laboratory confirmation.

Recreational water: Waters used for swimming, whirlpools, hot tubs, spas and water parks; includes naturally occurring fresh and marine surface waters.

Reservoir: The habitat or organism in which an infectious agent normally lives, grows and multiplies.

Surveillance: The detection of health problems through the appropriate collection of data, followed by its collation, analysis, interpretation, and dissemination.

Susceptible: A person lacking sufficient resistance to a particular disease agent to prevent disease if or when exposed.

Vehicle: An inanimate intermediary in the indirect transmission of an agent that carries the agent from a reservoir to a susceptible host.

Virulence: The degree of pathogenicity of an infectious agent.

Waterborne outbreak (WBO): Two criteria required: (1) two or more people experience a similar illness after the ingestion of drinking water or after exposure to water used for recreational purposes, and (2) epidemiologic evidence must implicate water as the probable source of the illness. (The requirement for "two or more" is waived for single cases of laboratory-confirmed primary amebic meningoencephalitis and for single cases of chemical poisoning if the water-quality data indicate contamination by the chemical.)

> **Note:** Outbreaks caused by contamination of water or ice at the point of use (e.g., contaminated water containers) should be reported as FBOs.

Zoonosis: An infection or an infectious disease transmissible under natural conditions between animals and man.

C. Purpose of the outbreak investigation

1. Control and prevention

The primary reason to investigate an outbreak is to control the occurrence of disease and prevent further disease. Therefore, it is necessary to first determine whether the outbreak is ongoing or is over. If the outbreak is ongoing, the first goal should be to prevent new cases. If the outbreak has already occurred, the goal should be to determine the factors or sources that contributed to the outbreak and prevent them from occurring in the future.

2. Surveillance

Outbreak investigations can add valuable information to ongoing public health surveillance activities. The goal of surveillance is not to compile numbers of cases of illness for administrative purposes, but to provide data that are important to guide public health policy and action. Continual surveillance adds to existing knowledge regarding the potential for and occurrence of a disease in a population.

3. Research opportunities

An important objective of an outbreak investigation is to gain additional knowledge regarding the natural history of the disease. Carefully conducted investigations may reveal trends, new or overlooked disease agents, novel vehicles or transmission modes, groups at risk or specific risk factors. New knowledge may also be gained by assessing the impact and effectiveness of control measures.

4. Training opportunities

Outbreak investigations may offer the LHD an opportunity to work closely with more experienced epidemiologists, become familiar with investigative techniques or practices, develop thought processes used in designing questionnaires and interviewing, and gain valuable on-the-job training and experience for future outbreaks.

5. Administrative concerns

Identifying the cause of outbreaks may be used to evaluate and improve current health programs in the community, identify high risk groups or etiologic agents previously overlooked and guide future strategies and future allocations in these areas.

6. Political or legal concerns

There may be overwhelming pressures placed on the LHD by families of affected individuals, the media, local politicians and others to determine the source of an outbreak and whether it may pose a continued or future threat to the community.

II. SUMMARY OF FOODBORNE AND WATERBORNE OUTBREAKS

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A. Foodborne outbreaks

During 1987-1996, a total of 249 FBOs were reported to Wisconsin Division of Health. These FBOs were associated with over 10,238 illness, 259 hospitalizations and three fatalities (Table 1).

Table 1. Morbidity table of FBO's, Wisconsin, 1987-1996.

Etiologic Agent	FBOs	# Cases	Mean (Range)	# Hosp.	# Deaths
Bacterial					
Bacillus cereus	3	36	12 (5-20)	0	0
Bacillus sp.	2	407	203 (157-250)	0	0
Campylobacter jejuni	6	185	31 (7-82	6	0
C. jejuni, & *S. typhimurium*	1	31	31	0	0
Clostridium botulinum *	2	2	1 (1-1)	2	1
Clostridium perfringens	30	2,252	75 (3-600)	1	0
Enterotoxigenic *E. coli*	1	205	205	0	0
E. coli 0157:H7	3	108	36 (26-55)	16	0
Listeria monocytogenes	1	19	19	7	0
Salmonella enteritidis	10	422	42 (3-258)	38	0
S. enteritidis, S. hadar and *S. typhimurium*	1	9	9	0	0
Other *Salmonella* serotypes	17	476	28 (3-86)	37	1
Shigella sonnei	2	36	18 (2-34)	1	0
Staphylococcus aureus	12	430	34 (2-71)	44	1
Total	91	4,618	49 (1-600)	152	3
Viral					
Calicivirus ("Norwalk-like")	61	2,907	48 (6-295)	26	0
Hepatitis A virus	8	398	50 (11-230)	20	0
Rotavirus	1	29	29	0	0
Total	70	3,334	48 (6-295)	46	0
Other					
Cryptosporidium parvum	1	6	6	0	0
Scombroid poisoning *	3	10	3 (1-5)	1	0
Trichinella spiralis	1	41	41	4	0
Total	5	57	11 (1-41)	5	0
Unknown					
Unknown	74	1,907	25 (2-167)	22	0
Total for 1987-1996	**249**	**10,238**	**41 (1-600)**	**259**	**3**

* Prior to 1992 single cases of *Clostridium botulinum* and Scombroid poisoning could be reported as outbreaks, but since 1992, at least 2 cases are required.

Table 1 shows the number of confirmed FBOs and their etiologic agents. The highest percentage (37%) of bacterial FBOs were caused by *Salmonella* species and were associated with 1287 (26%) of the cases, 109 (59%) of the hospitalizations, and one (33%) of the fatalities. *Clostridium perfringen* caused 30% of the bacterial FBOs and the highest number of cases, 2252 (46%). *Clostridium perfringens* outbreaks were associated with only one hospitalization and no fatalities. The other fatalities during a FBO were associated with *Staphylococcus aureus* and *Clostridium botulinum* Among all reported FBOs the bacterial agents were responsible for 186 (72%) of the hospitalizations and all three (100%) fatalities.

There were 144 (58%) FBOs suspected to be viral in origin or of unknown origin. These outbreaks are usually less severe and involved 68 (26%) of the hospitalizations and no fatalities.

An etiologic agent was not confirmed in 135 (54%) of the 249 outbreaks. In some of these outbreaks of unknown etiology, pathogens may not have been identified either because individuals refused to submit a stool specimen, or laboratory investigations were initiated too late or were incomplete. In other cases, infectious agents may not have been identified because they may not have been recognized or because of limitations of available laboratory techniques.

Table 2. FBOs in Wisconsin, 1987-1996.

Etiologic Agent	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**TOTAL**
Bacterial											
Bacillus cereus				2					1		3
Bacillus spp.				2							2
Campylobacter jejuni		1	2						2	1	6
C. jejuni and S. typhimurium										1	1
Clostridium botulinum	1				1						2
Clostridium perfringens	4	3	7	2	3	2	2	3	1	3	30
E. coli 0157:H7		1						1	1		3
Enterotoxigenic *E. coli*								1			1
Listeria monocytogenes									1		1
Salmonella spp.	3	4	7	4	3	3	2	5	2	4	37
Shigella sonnei	1									1	2
Staphylococcus aureus		1	1	3	3	1	2	1			12
Viral											
Calicivirus ("Norwalk-like")	9	8	13	7	6	1	2	6	4	5	61
Hepatitis A virus	2			2		2	1		1		8
Rotavirus										1	1
Parasitic											
Cryptosporidium parvum							1				1
Trichinella spiralis					1						1
Other											
Scombroid poisoning	1						2				3
Unknown	5	4	4	6	7	11	8	14	11	4	74
TOTAL	26	22	34	28	24	20	20	31	24	20	249

Foodborne outbreaks were reported from 54 (75%) of Wisconsin's 72 counties (Table 3). The five counties with the most reported outbreaks were: Milwaukee (28), Dane (25), Outagamie (13), Kenosha (10) and Brown (9). Of all the counties reporting FBOs and WBOs, Door County was the only county that had more WBOs (6) than FBOs (3). The number of outbreaks reported per county may be a reflection of geography, population base and reporting methods. In many cases, LHDs which report the most cases or outbreaks may also be those with the most sensitive public surveillance systems or those which perform thorough follow-up investigations of foodborne complaints.

Table 3. Wisconsin counties reporting FBOs and WBOs, 1987-1996.

COUNTY	FBO	WBO	COUNTY	FBO	WBO
Adams	2	0	Marathon *	4	1
Ashland	1	1	Marinette	4	1
Barron	3	0	Marquette	1	0
Bayfield	1	0	Menominee	1	0
Brown	9	0	Milwaukee	28	1
Buffalo	1	0	Monroe	2	0
Burnett	0	0	Oconto	1	0
Calumet	4	0	Oneida	5	0
Chippewa	3	1	Outagamie	13	0
Clark	0	0	Ozaukee	8	0
Columbia	6	0	Pepin	0	0
Crawford	0	0	Pierce	0	0
Dane	25	4	Polk	1	0
Dodge	6	0	Portage	5	0
Door	3	6	Price	0	0
Douglas	0	0	Racine	7	0
Dunn	3	1	Richland	0	0
Eau Claire	3	1	Rock	4	1
Florence	0	0	Rusk	1	0
Fond du Lac	5	0	Sauk	5	0
Forest	0	0	St. Croix	0	0
Grant	3	0	Sawyer	0	0
Green	2	0	Shawano	1	1
Green Lake	0	0	Sheboygan	7	1
Iowa	1	0	Taylor	0	0
Iron	0	0	Trempealeau	3	0
Jackson	0	0	Vernon	3	0
Jefferson	3	0	Vilas	1	0
Juneau	3	0	Walworth	5	0
Kenosha	10	0	Washburn	1	0
Kewaunee	0	0	Washington	2	0
La Crosse	8	1	Waukesha	8	0
Lafayette	2	0	Waupaca	4	0
Langlade	1	0	Waushara	1	0
Lincoln	1	0	Winnebago	6	2
Manitowoc	7	1	Wood *	1	0
			TOTAL	249 *	24

* One outbreak involving Marathon and Wood County

Foodborne outbreaks occurred during all months of the year but were most frequent in the late spring (Figure 1). Occurrence of FBOs with defined bacterial etiologic agents tended to increase in the late spring, peak in summer, and gradually taper off in late fall (Figure 2). Viral ("Norwalk-like" virus) outbreaks and outbreaks of unknown origin occurred throughout the year, but demonstrated peaks in the late spring and fall (Figures 3 & 4).

Reports from 118 of the 249 outbreaks identified factors which contributed to the outbreaks (Table 4). Improper storage or holding temperatures contributed to 60 (24%) and poor personal hygiene contributed to 39 (16%) of these outbreaks.

Table 4. Number of FBOs by etiology and contributing factors, Wisconsin, 1987-1996.

			Contributing Factors *					
Etiology	**# FBOs reported**	**# FBOs factors reported**	**Factor 1**	**Factor 2**	**Factor 3**	**Factor 4**	**Factor 5**	**Factor 6**
Bacterial								
Bacillus sp.	5	2	2	2	0	0	0	0
Campylobacter jejuni	6	3	2	1	1	1	0	0
Campylobacter & Salmonella	1	0	0	0	0	0	0	0
Clostridium botulinum	2	2	0	2	0	0	0	0
Clostridium perfringens	30	22	22	9	4	0	0	1
E. coli 0157:H7	3	3	1	1	1	0	1	0
Enterotoxigenic *E. coli*	1	0	0	0	0	0	0	0
Listeria monocytogenes	1	1	0	0	1	0	0	0
Salmonella sp.	37	21	15	14	6	1	2	1
Shigella sonnei	2	1	0	0	0	0	1	0
Staphylococcus aureus	12	9	8	1	1	1	2	2
Viral								
Calicivirus ("Norwalk-like")	61	27	3	0	1	1	21	7
Hepatitis A virus	8	7	0	0	0	0	6	1
Rotavirus	1	0	0	0	0	0	0	0
Parasitic								
Cryptosporidium parvum	1	0	0	0	0	0	0	0
Trichinella spiralis	1	1	0	1	0	0	0	0
Other								
Scombroid poisoning	3	2	1	0	0	1	0	0
Unknown								
Unknown	74	17	6	2	3	0	6	8
Total	249	118	60	33	18	5	39	20

* Factor 1. Improper handling, temperature or storage
Factor 2. Inadequate cooking
Factor 3. Contaminated equipment
Factor 4. Food from unsafe source
Factor 5. Poor personal hygiene.
Factor 6. Other factors

A specific vehicle of pathogen transmission was identified in 150 of 249 FBOs (Table 5). Meat or gravy were associated with the largest percentage of outbreaks (43%), followed by salads (23%) and dairy products (8%).

In the majority of FBOs reported, the place of preparation was a restaurant (54%) accounting for 5,316 cases, followed by a caterer (8%) (which in many case was affiliated with a restaurant) with 1,102 cases and home preparation (7%) with 350 cases (Table 6). Schools accounted for 3% of FBOs, but reported 1,087 (11%) of the illnesses related to FBOs.

B. Waterborne Outbreaks

From 1987 through 1996, a total of 23 WBOs were reported to the Wisconsin Division of Health, and were associated with over 1,149 illnesses, 13 hospitalizations, but no fatalities (Table 7).In addition to these outbreaks, in 1993 the largest WBO ever recorded in the United States occurred in Milwaukee. The massive waterborne outbreak of *Cryptosporidium* infections was associated with over 403,000 cases of watery diarrhea, 4400 hospitalizations and 69 fatalities among residents of five counties of the greater Milwaukee area. Because of the magnitude of the Milwaukee outbreak, numerical data related to the other 23 WBOs will be reported separately.

Table 7. Morbidity table of WBOs, Wisconsin, 1987-1996.

Etiologic Agent	WBOs	# Cases	Mean (Range)	# Hosp.	# Deaths
Bacterial					
E. coli 0157:H7	1	8	8	7	0
Legionella pneumophila	3	36	12 (6-16)	1	0
Pseudomonas aeruginosa	6	126	21 (8-29)	1	0
Shigella sonnei	1	10	10	1	0
Total	11	180	16 (6-29)	10	0
Viral					
Calicivirus (“Norwalk-like”)	4	727	182 (79-340)	1	0
Rotavirus	1	26	26	1	0
Total	5	753	150 (26-727)	2	0
Parasitic					
Cryptosporidium parvum *	4	140	35 (5-64)	1	0
Cryptosporidium parvum **	1	403,000	403,000	4,400	69
Total	5	403,140			
Other					
Heavy metal (Copper)	1	22	22	0	0
Unknowns	2				
Total	**1**	**22**	**22**	**0**	**0**
Total for 1987-1996 *	**23**	**1,149**	**50 (5-727)**	**13**	**0**
Total for 1987-1996 **	**1**	**403,000**	**403,000**	**4,400**	**69**

* *Cryptosporidium* outbreaks (Not Milwaukee Outbreak)
** Milwaukee *Cryptosporidium* outbreak, 1993

Cryptosporidium was associated with five outbreaks (21%) and over 403,000 illnesses (Table 2), all occurring in 1993, the same year as the Milwaukee outbreak and the only year during the 10-year period in which outbreaks related to *Cryptosporidium* were reported. Of note, the four smaller of these outbreaks followed the Milwaukee outbreak, and all were associated with either public community swimming pools or motel swimming pools.

Table 8. WBOs in Wisconsin, 1987-1996.

Etiologic Agent	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	TOTAL
Bacterial											
E. coli 0157:H7									1		1
Legionella pneumophila		1			1					1	3
Pseudomonas aeruginosa	1				3	1				1	6
Shigella sonnei				1							1
Viral											
Calicivirus ("Norwalk-like" virus)	1	1		1					1		4
Rotavirus									1		1
Parasitic											
Cryptosporidium parvum							5				5
Other											
Chemical									1		1
Unknown					1					1	2
TOTAL	2	2	0	2	5	1	5	0	4	3	24

Pseudomonas aeruginosa associated with hot tubs ("hot tub folliculitis") was the most common etiologic agent among WBOs and involved six (25%) of the 24 outbreaks (Figures 5 & 6). In 1995, Wisconsin recorded its first waterborne outbreak of *E. coli* 0157:H7 related to recreational water. This organism had more widely been associated with foodborne illness especially associated with undercooked ground beef. This illustrates that organisms which are not commonly thought to be associated with either foodborne or waterborne illness should not be overlooked. It also reinforces the need to examine clinical symptoms and laboratory results together. Not all WBOs may be recognized, investigated, or reported.

C. Investigation trends

1. FBO's of shorter onsets (5 minutes to 8 hours) such as chemical or staphylococcal intoxication are more likely to be recognized than those diseases with longer onset times or incubation periods (more than several days) such as Hepatitis A virus.

2. FBOs involving less commonly identified foodborne pathogens (e.g., *Bacillus cereus, Cryptosporidium parvum*) are less likely to be confirmed because these organisms are sometimes not considered by clinicians, investigators and laboratorians.

3. Pathogens that usually cause mild illness may be under-represented (e.g., rotavirus, other viruses) among reported FBOs.

4. Pathogens causing illnesses of relatively brief duration or associated with short time frames to collect the appropriate clinical specimens are often not recognized or confirmed (e.g., *Clostridium perfringens*).

5. Outbreaks associated with restaurants or commercial products are more likely to be reported than those involving foods prepared and served in the home.

Note: These trends apply more directly to FBOs, rather than WBOs. It is more difficult to denote trends in WBOs because they are harder to detect and often go unrecognized. In the investigation of outbreaks, LHDs should consider the possibility that illnesses may be caused by waterborne pathogens as well as foodborne pathogens.

D. Comment on foodborne viral infections

Foodborne viral infections are caused by two types of virus, caliciviruses (also known as "Norwalk-like" viruses or small round structured viruses - SRSVs) which cause gastroenteritis and hepatitis A virus which causes hepatitis. This section, *"Comment on foodborne viral infections"* addresses the outbreaks associated with caliciviruses. Information regarding hepatitis A foodborne outbreaks is extensively covered in the DOH manual *"Hepatitis A: A Handbook for Public Health Personnel"* (POH 4554).

In Wisconsin, caliciviruses were suspected in 61 (25%) of the 249 FBO's reported between the years 1987 through 1996. Among the remaining 188 outbreaks, 74 (30%) FBOs had unknown etiologic agents, some of which may have been viral. Viral FBOs in Wisconsin occur throughout the year, but typically peak in late spring and late fall.

Although foodborne viruses are a common cause of gastroenteritis, and may often be the cause of outbreaks of illness, foodborne transmission is difficult to prove. Contamination of food by

infected food workers is probably the most common cause of viral foodborne illness. Food items such as salads, submarine sandwiches and dessert dishes that receive considerable handling during preparation and are not cooked before being served are often implicated in foodborne viral outbreaks. Salads or submarine sandwiches were implicated as the vehicle responsible for illnesses in 43 FBOs during the years 1987 through 1996. Of these FBOs, the etiologic agent was bacterial in 11 (26%), caliciviruses in 25 (58%), Hepatitis A virus in 2 (5%) and unknown etiology in 5 (12%).

Following a viral FBO, especially due to caliciviruses, secondary infections acquired by person-to-person transmission are commonly noted in individuals who did not consume contaminated foods.

1. Survival of viruses

Caliciviruses are hardy and may survive for prolonged periods in foods or the food handling environment. They are highly resistant to chilling, freezing, preservatives, ionizing radiation, alcohol, and high sugar concentrations. They are also resistant to acidic conditions (pH 3) and can survive on acidic fruits (such as strawberries and raspberries) and can survive processes such as pickling in vinegar or yogurt production. Caliciviruses can survive temperatures up to 60^{o} C (140^{o} F) for 30 minutes.

Illness caused by caliciviruses is usually sudden in onset, and is characterized by vomiting, diarrhea and abdominal pain. Vomiting occurs more frequently in children and adolescents than in adults, usually occurs without warning, and may be projectile. The incubation period is usually 24-48 hours after eating an implicated food, and is dependent on the number of virus particles ingested. Because the viruses involved are highly infectious, the attack rate in an outbreak can be very high. Duration of illness usually ranges from 24-48 hours, although ill individuals may not feel completely recovered for several weeks.

2. Source

Viruses require a host in order to multiply, and the original source of all foodborne viruses is the human intestine. Because viruses cannot grow in food, contamination of food may occur either during preparation and serving by infected food workers or by contact with contaminated water.

In the U.S. most confirmed outbreaks of viral foodborne illness have been associated with the consumption of shellfish that had been harvested in sewage-polluted waters. Shellfish such as oysters or mussels are the most common vehicle for foodborne viruses. According to the Institute of Food Science and Technology (UK), these shellfish are usually harvested in shallow coastal waters or estuaries, commonly near sewage outlets and have been implicated in several large foodborne outbreaks along the gulf coast from Louisiana to Florida. In Wisconsin, such cases may be noted in people returning home from vacations to southern states or Caribbean cruises.

Fruits and raw vegetables which have been fertilized or irrigated with sewage-contaminated water or which are prone to other modes of fecal contamination, may act as vehicles of infection when consumed as condiments or salad ingredients if not properly washed beforehand. Consumption of contaminated water and ice or their use in food preparation may also cause viral illness and should not be overlooked in FBO investigations.

3. Management of food workers

All food employees and handlers symptomatic with vomiting or diarrhea should be immediately excluded from work. It is recommended that unless a person has excellent hygiene, they not return to work until at least 48 hours after cessation of symptoms. This is often overlooked by food managers because, after the initial onset of symptoms, the illness may appear mild enough to allow the food worker to continue working. Early return to work should be avoided because even relatively low numbers of virus particles transferred to food may result in illness. Staff should also be made aware that they could transfer viral particles to food via hands and clothing following contact with an ill family member even though they themselves are not ill. Prevention of foodborne viral illness requires good staff supervision, and food handlers should be encouraged, not penalized, for reporting signs and symptoms of illness as soon as they occur.

4. Control

Investigating viral foodborne outbreaks can be complex and frustrating because of the inability to definitively identify a pathogenic agent in patient specimens or to isolate pathogenic agents from food or water.

Contamination of food usually occurs on the surface of the food, where viruses will be more susceptible to heat treatment. Heat processes commonly used in the food industry will significantly reduce the level of virus contamination, but may not destroy or inactivate all viruses if the contamination level was very high.

The number of virus particles required to cause infection is very low and contamination of food by infected food workers and person-to-person spread can easily occur. After using the toilet and before all preparation of food thorough handwashing with soap and warm running water and drying with disposable towels or hand dryers are essential to minimize the spread of contamination.

If vomiting has occurred in the kitchen, a disinfection program appropriate for viral decontamination of the environment must be implemented. Care should be taken while cleaning vomitus since inhalation of viral particles may take place while cleaning contaminated surfaces. Cleaning and disinfection of these surfaces is best achieved by using hot water and detergent followed by chlorine-based disinfectant at a strength of 500 ppm available chlorine (1:100 dilution of 5% chlorine bleach or ¼ cup of bleach in one gallon of water). Bleach solutions

should be made fresh daily. Contaminated food items should be disposed of to prevent cross-contamination and re-infection. Any soiled clothing should be rinsed to remove gross contamination, preferably into the toilet bowl, and then laundered in a domestic or commercial washing machine with a hot cycle.

5. Detection *(This should be updated)*

Methods currently used for detection of caliciviruses in feces are based on electron microscopy EM) or polymerase chain reaction (PCR) assay. At least one million virus particles per gram of feces must be present in the stool to be detected by EM, and only fecal samples obtained within 48 hours of the onset of symptoms are suitable for examination. A recently developed PCR test is more sensitive than EM and may be able to detect virus particles in feces up to seven days after onset of symptoms, although as each day passes, the likelihood of recovering virus particles may become diminished. The WSLH has recently completed an evaluation of the PCR test; testing is available with prior arrangements with the DOH. Use of this test should enable the laboratory to confirm the detection of calicivirus infections and reduce the number of "suspected" viral or "unknown" foodborne disease outbreaks.

Detection of viruses in food is not possible in a routine laboratory because virus particles tend to be few in number in a contaminated food and require a living host for growth. The use of PCR is also being evaluated for detection of viruses in foods implicated as the source of outbreaks, but is still under investigation.

6. Summary

All foodborne viruses originate from the human intestine; contamination of food occurs either during preparation by infected food workers or fecally contaminated water. Viruses are too small to be seen with a conventional microscope, cannot be cultured on bacterial media, and can cause diseases that cannot be successfully treated with conventional drugs. Control measures mainly depend on staff education and good personal and kitchen hygiene. All staff should be made aware of the ease with which foods can be contaminated by viruses; food workers experiencing signs or symptoms of illness should be excluded from work immediately. The use of clean water for irrigation of crops that are likely to be eaten raw and cultivation of molluscan shellfish in sewage-free seawater are also essential to prevent viral contamination of food.

III. ROLES AND RESPONSIBILITIES

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A. Food employee or worker

"Any person knowingly infected with a disease in a form that is communicable by food handling who handles food products to be consumed by others and any persons knowingly employing or permitting such a person to handle food products to be consumed by others shall be punished as provided by s. 252.25." (Wisconsin State Statutes)

1. Maintain good personal hygiene, including frequent and thorough hand washing practices.
2. Practice good food handling procedures.
3. Notify employers of illness, and exclude self from work when ill with gastrointestinal symptoms (e.g., abdominal cramping, vomiting, diarrhea, jaundice), optimally for 48-72 hours following resolution of symptoms. This may also apply when the food worker has exposed skin lesions.
4. Fully cooperate with LHD during investigations of foodborne illness.

B. Food establishment licensee

1. Train employees and management as to proper food handling practices and hand washing.
2. Exclude employees with apparent gastrointestinal illness or exposed skin lesions from work.
3. Avoid practices that punish or discourage employees from reporting illness.
4. Cooperate with LHDs during investigations of foodborne illness.
5. Provide adequate toilet and hand washing facilities for employees and ensure proper use.

C. Physicians, Health care providers

"Any person licensed, permitted, registered or certified under ch. 441 or 448 knowing or having reason to know that a person treated or visited by him or her has a communicable disease, ..., shall report the appearance of the communicable disease or the death to the local health officer."

1. Report to LHD by telephone immediately upon recognition of a suspected FBO or WBO. Although not required by law, the physician should consider contacting the LHD regarding any person with a communicable enteric disease whom they know works as a food worker.
2. Cooperate with LHD in the investigation and control of an outbreak, including collecting specimens if requested.
3. Encourage patients to adhere to the prevention and control recommendations of the LHD.

D. Local health department (LHD)

"Local health officers may do what is reasonable and necessary for the prevention and suppression of disease;..."

1. Conduct the initial investigation of a suspected outbreak. The investigation should be directed by the LHD in whose jurisdiction the outbreak originated.
2. Provide direction to food establishment operators regarding the application and removal of food employee exclusions and restrictions.
3. Immediately notify BPH Regional Office and/or the CDS of any FBO or WBO outbreak as early in the investigation as possible.

4. Request assistance of the BPH Regional Office and/or CDS, if needed, to control the spread of the outbreak.
5. Obtain laboratory specimens, conduct interviews, compile line lists, obtain onset times and other important epidemiologic data.
6. Provide education to food handlers regarding proper food handling and personal hygiene.
7. Complete a foodborne (DPH 9081) or waterborne (DPH 9213) outbreak report form and mail a copy to CDS, BPH.
8. Maintain an ongoing foodborne disease complaint file or log.
9. Assume local costs of the investigation. BPH will cover expenses incurred by BPH staff on-site.

E. Bureau of Public Health (BPH) - Regional Office Director and Staff

1. Provide assistance in coordinating outbreak investigations (especially those involving multiple jurisdictions) and ensure the involvement of all appropriate local agencies.
2. Provide consultation and obtain appropriate technical assistance for the LHD in epidemiologic investigation of disease outbreaks.
3. Assign appropriate regional staff (public health nurses, sanitarians, nutritionists, educators, other regional staff) to participate in investigations, as needed.
4. Notify CDS of all investigations, and other agencies indicated in Appendix B as necessary.
5. Assist the LHDs in completing outbreak investigations, initiating control measures, and submitting the DPH and/or CDC report forms to CDS.

F. BPH - Regional Public Health Sanitarian or LHD Sanitarian

1. Coordinate environmental investigation with epidemiologic investigations being conducted by LHDs.
2. Inspect establishment and enforce rules pertaining to the regulation of hotels, tourist rooming houses, bed & breakfast establishments, restaurants, food and beverage machines, vending commissaries, campgrounds, public swimming pools, recreational and educational camps.
3. Conduct or direct a complete sanitation investigation of the facility or site of a suspected outbreak. Do a Hazard Analysis and Critical Control Points (HACCP) investigation for implicated food(s).
4. Collect food, water, and other specimens as needed, and send them to the WSLH.
5. Consult and participate (as needed) in investigations of FBO and WBOs not specifically involving licensed facilities or sites.
6. Send copy of the sanitarian's inspection report and narrative of inspection to LHD and CDS.

G. BPH - Communicable Disease Section (CDS)

1. Provide consultation and technical assistance to DOH regional office staff and LHD staff in the epidemiologic investigation of disease outbreaks.
2. Provide guidelines for the epidemiologic investigation and control of a specific outbreak consistent with state and national objectives, current policy, and current medical and scientific literature.
3. Determine whether a particular outbreak warrants further epidemiologic investigation and the nature and extent of additional epidemiologic or laboratory data required.

4. Keep ESU and Regional DPH offices informed of the progress of any FBO investigation.
5. Identify and arrange for additional staff and material resources from the BPH if an outbreak exceeds the resource capacity of the LHD and the BPH Regional Office.
6. Provide advice on collection of food, water, or other specimens in coordination with WSLH.
7. Recommend and request implementation of control measures.
8. Maintain and distribute surveillance information and summary reports relating to FBOs and WBOs to LHDs, Regional Offices, physicians and other agencies.
9. Provide training materials instructive in the methods of FBO and WBO investigations.

H. BPH - Environmental Sanitarian Unit (ESU)

1. License the following establishments and facilities regulated under Chapter 254, ENVIRONMENTAL HEALTH, Subchapter IV and VII of the Wisconsin Statutes: restaurants, hotels, motels, tourist rooming houses, public swimming pools, recreational and educational camps, bed and breakfast establishments, vending commissaries, and food vending machines.
2. Provide technical assistance, training and support to BPH regional offices and agent health departments, when requested, regarding the investigation and follow-up of FBOs and WBOs related to the above-mentioned licensed establishments.
3. Contract with LHD agents to provide investigation services for the above-mentioned establishments and facilities within their jurisdiction.

   Note: Not all LHDs are agents for the DOH Environmental Sanitation Unit. Only those LHDs with qualified personnel and an "Agent Terms of Agreement" are considered agents by ESU for the purpose of licensing and inspecting facilities and establishments regulated under Chapter 254, Subchapter IV and VII of the Wisconsin Statutes.

4. Monitor and evaluate the inspection and enforcement procedures and practices of BPH regional offices and agent health department environmental sanitation programs to promote uniform interpretation and application of rules relating to the above-mentioned licensed establishments.
5. Evaluate BPH Regional Office and agent health department policies and procedures for the investigation of food and waterborne disease complaints and suspected outbreaks.
6. In conjunction with BPH Regional Office sanitarians and LHD, take official action to close DPH licensed facilities and establishments if necessary and direct the implementation of other control measures as needed.
7. Authorize the reopening of the above facilities and establishments when an investigation determines that the threat to public health no longer exists.

I. BPH - Bureau of Quality Assurance (BQA)

1. Conduct surveys and complaint-related investigations of nursing homes, general and special hospitals, home health agencies and other health care providers to determine compliance with state licensure rules and federal Title 18/19 certification regulations.
2. Conduct epidemiologic investigations, in cooperation with the LHD, at a health care facility when an outbreak is suspected to determine the cause and prevent further infections.
3. Evaluate the facility's infection control techniques, food handling techniques, communicable disease-related procedures and communicable diseases reporting to assure that the measures comply with appropriate state and federal regulations and are properly implemented.
4. Take enforcement actions in the event the facility fails to comply with appropriate rules, regulations and procedures.

J. Wisconsin State Laboratory of Hygiene (WSLH)

1. Provide consultation regarding proper collection and handling of food, clinical or environmental specimens.
2. Test food, clinical or environmental specimens for evidence of microorganisms, microbial toxins.
3. Report laboratory test results to LHD and CDS.
4. Forward specimens to CDC for more specific testing when indicated or requested by CDS or CDC for surveillance purposes.

K. Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP)

1. Assure good manufacturing practices in all commercial food operations, prevent contamination at producer or packer level, and perform testing of food products distributed in Wisconsin and nationwide.
2. Test dairy, meat and food products, including fruits and vegetables to determine if food is microbiologically or chemically contaminated.
3. If the suspected vehicle of human illness is commercial food product (dairy, processed food, beef, poultry or fruits and vegetables) which was produced in Wisconsin or which may have been contaminated while in storage, distribution, or sale in Wisconsin:
   - Sample suspect product, whether in distribution or at the process operation.
   - Conduct appropriate testing of suspect product.
   - Check plant records and inspect to determine if good manufacturing practices were or are followed and if contamination may have occurred.
   - Coordinate recall and/or public notice if contaminated food is in distribution.
4. Inform CDS staff of significant findings related to outbreak investigations and product recalls.

L. Wisconsin Department of Natural Resources (WDNR)

1. Issue boil water advisories as warranted.
2. Advise on water specimen collection and analysis interpretation.
3. Ensure correction of water supply system if necessary.

M. U.S. Food and Drug Administration (FDA)

1. Inspect food manufacturers, processors, and warehouses (excluding USDA-regulated products such as red meats and poultry) engaged in interstate commerce involving either the finished products or raw materials. Assure that such firms and their products comply with U.S. Food, Drug and Cosmetic Act and regulations promulgated under that act. All imported foods must also comply.
2. Conduct investigations into outbreaks involving foods where an interstate source is suspect. Investigate consumer complaints (investigations usually exclude FBOs where red meats, poultry, or poor food handling are involved.)
3. Investigate any reported cases of botulism linked to food. Attempt to make early identification of any commercially prepared foods responsible.
4. Collect and analyze implicated food items.
5. Enforce seizure, recall, injunction, or prosecution activities, when necessary. Encourage voluntary compliance.

Note: If the food product is processed in Wisconsin or may have become contaminated in Wisconsin, also contact Wisconsin DATCP - Division of Food Safety (608 / 224-4700).

IV. STEPS IN INVESTIGATING AN OUTBREAK

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Prompt response to food or water-related complaints is the foundation of a successful investigation. Important steps and information necessary to determine the initiation and extent of an investigation include examination of test results and preliminary evidence such as onset times, symptoms and duration of illness, development of hypotheses, assessment of the magnitude of the problem, and evaluation of available resources.

Once it is decided to begin an investigation, immediately notify the DPH Regional Office or the CDS, especially if there are cases from outside the jurisdiction of the LHD. These DPH offices may assist in coordinating the investigation, assist in the investigation if requested by the LHD, and can be consulted on collection of food, clinical, or environmental specimens.

The procedure for the investigation and determination of the existence of an outbreak is reasonably standard regardless of the disease being investigated. The steps listed below are not sequential and some contingency planning can be done before an outbreak. The steps in this procedure include:

- preparation for a detailed epidemiologic investigation
- establish the existence of an outbreak or epidemic
- verify diagnosis
- formulate a tentative hypothesis
- put control measures into operation
- conduct the investigation
- relate the outbreak to time, place and person
- analyze and interpret data
- test hypothesis and formulate conclusions
- prepare a final report of the investigation

A. Preparation for a detailed epidemiologic investigation

Although the steps in investigating an outbreak are not always implemented sequentially, planning an epidemiologic investigation may be considered as the initial step in the process because part of the planning can be done before an outbreak occurs. The LHD can begin by training personnel in how to compile line lists, develop questionnaires, conduct interviews, and use EPI-INFO. The LHD should have 6-8 stool culture kits on hand or readily available should an outbreak occur because stool specimens must be collected within 72 hours of onset to isolate and identify certain pathogens (e.g., *Clostridium perfringens*, *Bacillus cereus, Staphylococcus aureus*). Lists of contacts such as administrative contacts, additional personnel, sanitarians, regional contacts, physicians, clinical laboratories, or other persons who may become involved in outbreak investigations should be assembled. Resource materials describing signs and symptoms, incubation times and specifics regarding specimen collection and appropriate kits to be used should be maintained and readily available to those processing the initial calls. This may help in formulating an initial hypothesis. It is also very important for the LHD to realize in advance the limits of the LHD's resources. It is critical to determine at the beginning of an outbreak investigation whether the LHD has the resource to properly conduct the investigation. If the outbreak investigation requires additional resources, they should immediately notify the DPH Regional Office or the CDS. Once the investigation is underway, the proper clinical specimens should be collected as soon as possible before patients recover and become less likely to submit specimens, and before the general interest in the investigation wanes. All suspect FBOs and WBOs should be examined and a determination made regarding the feasibility of conducting an investigation, even if the time to collect proper clinical specimens has passed, in order to determine the source of the outbreak and to prevent similar outbreaks from recurring.

B. Establish the existence of an outbreak or epidemic

Establish the existence of an outbreak by comparing the incidence of the disease in a specified population during a comparable previous time period or when point source outbreaks occur. Be familiar with disease trends in the community and determine whether there actually is a higher than expected number of cases in a community. This can be done through diligent public health surveillance which provides an accurate assessment of the status of the health of the community and helps to determine any increases or decreases in communicable diseases in the local population. Surveillance data should be reviewed by the LHD on a regular basis to become familiar with the status of all communicable diseases in the area of jurisdiction. Be aware of artificial causes of increases such as: (1) changes in local reporting, (2) changes in case definitions of reportable diseases, (3) increased local or national interest in particular diseases, (4) new physicians in the area, (5) new diagnostic procedures which might identify new or existing infectious agents, and (6) increased populations or new arrivals into the area.

C. Verify diagnosis

Analyze clinical histories of cases and have laboratory tests performed to confirm or refute the tentative diagnosis and determine the etiologic agent associated with the illness. Clinical, laboratory and epidemiologic evidence should be considered. Verify that laboratory results are consistent with the clinical evidence as laboratory errors sometimes occur. In verifying the diagnosis, it is crucial to collect clinical and environmental samples as soon as possible because many etiologic agents become more difficult to isolate with time (e.g., *Bacillus cereus*, *Clostridium perfringens, Staphylococcus aureus*). As case-patients begin to recover they may become more reluctant to submit clinical samples. Also, when delay occurs, environmental samples are more likely to be discarded or disinfected.

D. Formulate a tentative hypothesis

Formulate a tentative hypothesis to explain the most likely cause of illness, etiologic agent, vehicle, and distribution of cases. Hypothesis generating is an ongoing process which may begin with the first phone call. This hypothesis is based on data (e.g., incubation periods, symptoms, foods) that have been collected as well as knowledge about the various agents responsible for outbreaks. The tentative hypothesis directs the course of an investigation and control measures, and is tested by data gathered during the investigation. Develop several hypotheses if necessary. A series of hypotheses may evolve during an investigation. First, facts are examined and broad hypotheses are formulated. As more facts are gathered, a more specific hypothesis may be formulated. Confirm the diagnosis if laboratory testing has been completed. Ensure specimens are submitted for diagnosis if this has not already been done. Examine case histories to determine if there are common exposures, or if signs and symptoms and onset of illness are consistent with etiologic agents. Next, additional facts to test the new hypothesis are gathered. The cycle is continued as necessary. Consult the CDS if you need assistance generating hypotheses.

E. Put control measures into operation

The priority during each investigation should be to devise effective control measures based upon the available facts. Begin developing control measures early in the course of the investigation based on the initial hypotheses. Factors to consider when determining the most effective control measures include the extent of the illness, who was affected, when and where did the critical exposure take place, what was the vehicle or how was the disease transmitted, what is the etiologic agent and whether there is a potential for ongoing or future transmission. The control measures should focus on specific agents, sources, or reservoirs of infection and should be targeted to interrupt the transmission of disease or reduce exposure to disease. These measures should be instituted as soon as possible to control the current problem and demonstrate to the community that efforts are being made to control the problem. Use the information collected during the investigation to control the current situation and to prevent future problems in the community. If the control measures do not appear to be effective, corrected measures can be taken at an appropriate time.

F. Conduct the investigation

1. Prepare a line list of ill persons listing signs, symptoms, onset times, duration of illness.
2. Gather appropriate community and environmental information; investigate potential sources of the responsible agent and factors that may have contributed to the outbreak.
3. Obtain clinical specimens (usually stool specimens) from up to **10** ill case patients for laboratory analysis of enteric pathogens.
4. When possible, obtain samples of implicated food or environmental samples for laboratory analysis. **Hold these samples under refrigeration** for culture for possible pathogen isolation. These specimens may need to be submitted after an etiologic agent has been isolated from ill individuals.

G. Relate the outbreak to time, place and person

If an outbreak occurs following a common meal or exposure (e.g., wedding, parties), conduct a survey of known or selected cases to investigate commonalties, such as onset of illness (**time**), population characteristics (e.g., age, gender) (**person**) and where they could have been infected or exposed (**place**). If an outbreak does not have an established common meal or exposure (e.g, an increase of cases of illness in a community within a close time frame), it may be necessary to start with an informational or preliminary survey in order to select case patients. Then develop a survey instrument or questionnaire and perform a case-control study. It is imperative to interview non-ill (controls) persons who are similar or had similar experiences regarding time and place to those ill. Begin by interviewing and analyzing data from **20-25 ill** persons (if available) **AND 20-25 well** persons who potentially had the same exposure but remained well. Obtain identifying information (name, address, telephone number, etc.); demographic information (age, sex, race, occupation or group characteristics); and clinical information (symptoms, onset times, and duration of illness).

Establish a Case Definition. Begin with broad or "loose" definitions, which may be narrowed as more cases are defined. Classify cases as "lab-confirmed" or "probable". Not all cases need to be lab-confirmed. Make case counts and relate these to the appropriate population to determine those groups at risk (e.g., same age groups, same sex, occupation). Develop a line listing of cases. Contact those with information on the illness or environmental circumstances contributing to the outbreak (e.g., physicians, sanitarians). A pattern can often be recognized from this information. When attempting to identify cases, additional contacts may need to be surveyed such as physicians, and appropriate staff in clinics, hospitals, and laboratories and friends of case-patients. In some situations, the media may be used to solicit case-patients, but this approach should be considered carefully to avoid biasing an epidemiologic investigation and damaging the reputation of local establishments unnecessarily.

H. Analyze and interpret data

Summarize field investigations. Compare and interpret all information collected and results of tests conducted. Construct **epidemic curves** to detect the course of the outbreak and to determine if the illness originated from a single source, calculate **attack rates**, develop appropriate **tables** and charts,

apply **statistical tests (EPI-INFO software)**, and interpret the cumulative data. Define the geographic extent of the outbreak and the population at risk. Ensure that there is no longer an ongoing source of transmission in the community. (See Control Measures above)

I. Test hypothesis and formulate conclusions

Accept or reject the hypothesis on the basis of the available data and appropriate statistical analysis. For a hypothesis to be accepted, the patterns of disease in the host must fit the nature of the agent, its source, its mode of transmission, and the contributory factors that allowed the outbreak to occur. If the hypothesis is rejected, another hypothesis should be developed and additional data should be gathered to test this new hypothesis. A more systematic study can be conducted when needed to improve the sensitivity and specificity of the findings, establish more accurately the true number of cases, and assist in arriving at more definitive conclusions.

J. Prepare a final report of the investigation

Investigations should be summarized as soon as completed and a report should be sent to the State Epidemiologist for Communicable Diseases, BPH, DPH. If done properly, these final reports serve as a record of the rationale for the activities of the investigation, and provide documentation should there be legal issues. It can also be used to improve future investigations and prevention measures. This report should follow the usual **scientific format** of introduction, background, methods, results, discussion, and recommendations. Avoid using names of case-patients or contacts in the final report to the State Epidemiologist. The names of LHD personnel or authorized personnel involved in the investigation should be included. The names of facilities or locations where the FBO or WBO occurred should be included.

The **background** is a short paragraph describing the circumstances which existed at the time the investigation was initiated. What happened? Who was affected? How many people were ill and how many were exposed? Where did the outbreak occur? Is it an ongoing problem? What was the severity and clinical presentation of the cases? Note whether or not the outbreak involved a particular setting or social event (e.g., school, restaurant, wedding, festival) or to particular population (e.g., nursing home, day care center). Mention whether there had been previous problems in the same areas or within similar groups of persons.

The **methods** section would list the case finding methods, content of case and control questionnaires, specimens collection results, laboratory tests performed, data collections methods, statistical methods (e.g., EPI-INFO software), control methods instituted, and other features of the investigations which were done to investigate, control or analyze the outbreak.

The **results** should list what was discovered in the investigation by the LHD, the sanitarian's report, results of laboratory testing of clinical or environmental samples, results of the epidemiologic investigation, statistical results, epi-curves, tables, charts and other studies.

The **discussion** should briefly summarize the findings of the investigation and then focus on the methods and findings. Evaluate the control and prevention methods instituted in this investigation. Were they successful? Could they be instituted in similar outbreaks in the future or how should they be changed? What problems were encountered by the LHD? Is the current surveillance program sufficient to identify and control future outbreaks? List any important or unique aspects of the outbreak or a specific disease agents uncovered during the investigation.

An example of a final outbreak investigation report may be found in Appendix F.

V. REFERENCES AND WEB SITES

V. REFERENCES

The following references are recommended for LHDs as guides in investigating FBOs and WBOs or other sporadic cases of infectious diseases. Copies of items 10, 11, 13, 14 and 16 are available from the CDS.

1. American Public Health Association. Standard Methods for the Examination of Water and Wastewater, 18th. ed. Washington, DC: 1992.

2. Benenson AS, ed. Control of Communicable Diseases Manual. 16th ed. Washington, DC: American Public Health Association, 1995.

3. CDC. Principles of Epidemiology. 2nd ed. Atlanta, GA: U.S. Dept. of Health and Human Services, Public Health Service, 1992.

4. CDC. Surveillance for Foodborne-Disease Outbreaks - United States, 1988-1992. *MMWR* 1996; 45(No. SS-5): 1-66.

5. CDC. Surveillance for Waterborne-Disease Outbreaks - United States, 1993-1994. *MMWR* 1996; 45(No. SS-1): 1-33.

6. CDC. *Cryptosporidium* infections associated with swimming pools - Dane County, Wisconsin, 1993. *MMWR* 1994;43(31):561-563.

7. CDC. Swimming-associated cryptosporidiosis - Los Angeles, County. MMWR 1990; 39(20):343-345.

8. CDC. Viral Agents of Gastroenteritis. *MMWR* 1990; 39(RR-5): 1-24.

9. Cliver DO, ed. Foodborne Diseases. San Diego, CA. Academic Press, Inc. 1990.

10. DOH Disease Fact Sheet Series.

11. EPINET Manual. Madison, WI: Wisconsin Division of Health, Communicable Disease Section, (Revised 4/97).

12. Fleischer, JM, Jones F, Kay D, Stanwell-Smith R, Morano R. Water and non-water-related risk factors for gastroenteritis among bathers exposed to sewage contaminated marine waters. *International J Epidemiol.* 1993;22:698-707.

13. Foodborne and Waterborne Disease Outbreaks, 1978-1993. *Wisconsin Epidemiology Bulletin (WEB)* 1995; 16(1): 1-4.

14. *Giardia*: Guidelines for Prevention and Control for Local Health Departments. Madison, WI: Wisconsin Division of Health, DHFS, Communicable Disease Section, 1996.

15. Gregg, MB, ed. Field Epidemiology. New York, NY: Oxford University Press, 1996.

16. Hepatitis A: A Handbook for Public Health Personnel. Madison, WI: Wisconsin Division of Health (POH 4554), DHFS, Communicable Disease Section, 1992.

17. Peter G, ed. 1997 Red Book: Report of the Committee on Infectious Diseases. 24th ed. Elk Grove Village, IL: American Academy of Pediatrics, 1997.

Reference list of communicable disease information on the World Wide Web:

Note: Care should be used when referencing materials from the Internet because of misinformation which may be present from any of a number of unofficial or independent sites. The web sites listed below are scientifically accurate and originate from reputable sources.

1. **Centers for Disease Control and Prevention (CDC)**
   (Health and travelers health information, immunizations, health news releases, publications, training opportunities)
   http://www.cdc.gov

2. **Cryptosporidiosis**
   (Site devoted exclusively to cryptosporidiosis)
   http://www.cdc.gov/ncidod/diseases/crypto/crypto.htm

3. **Emerging Infectious Diseases Homepage**
   (Current scientific articles on emerging diseases)
   http://www.cdc.gov/ncidod/EID/eid.htm

4. **Fight Bac**
   (Consumer information site on food safety and food handling issues)
   http://www.fightbac.org

5. **Prevention Guideline to Promote Your Personal Health and Safety**
   (Information on safety issues following floods)
   http://www.cdc.gov/nceh/programs/emergenc/prevent/flood/flood.htm

6. **Healthfinder**
   (Site to help consumers find health and human services information quickly)
   http://www.healthfinder.gov

7. **MEDLINE**
   (World's most extensive collection of current published medical information, free Med-line searches)
   http://www.nlm.nih.gov

8. **National Food Safety Database**
   (Consumer information related to food safety)
   http://www.foodsafety.org

9. Surf Your Watershed

(Consumer site to locate, use and share environmental information on their watershed or community)

http://www.epa.gov/surf

10. U.S. Dept. of Agriculture (USDA)

(Current topics related to food issues)

http://www.usda.gov/agency/fsis

11. U.S. Environmental Protection Agency (EPA) - Beach Program

(Information on beach closings, swimming advisories, contacts for additional information on beach water qualtity)

http://www.epa.gov/OST/beaches

12. U.S. Environmental Protection Agency (EPA) - Envirofacts

(Consumer site for answers to questions regarding their drinking water systems, people served, EPA violations, etc.)

http://www.epa.gov/enviro/html/sdwis/sdwis_ov.html

13. U.S. Environmental Protection Agency (EPA) - Microbiology Homepage

(Water-related issues, waterborne disease, regulations)

http://www.epa.gov/microbes

14. U.S. Environmental Protection Agency (EPA) - Office of Ground Water and Drinking Water

(Consumer site for current ground water and drinking water information, publications and regulations)

http://www.epa.gov/OGWDW

15. U.S. Food & Drug Administration (FDA) - FDA News and Publications

(Press releases, publications and issues related to current food issues)

http://www.fda.gov/opacom/hpnews.html

16. Wisconsin Dept. of Health & Family Services (DHFS)

(Programs, employment, training and resource materials)

http://www.dhfs.state.wi.us

17. Wisconsin Dept. of Natural Resources (WDNR)

(Directory of WDNR departments, services, permits, etc.)

http://www.dnr.state.wi.us

18. World Health Organization (WHO)

(Current health issue press releases, fact sheets and general information on international health)

http://www.who.ch/

VI. APPENDICES

APPENDIX A

Criteria for Confirmation of Etiologic Agents

Table 9A. Criteria for confirmation of bacterial agents responsible for foodborne and waterborne illness.

Etiologic Agent	Incubation Period Average (Range)	Clinical Syndrome	Characteristic Foods
Bacillus cereus	**A. Vomiting type** 2-4 hours (1-6 hours) **B. Diarrheal type** 12 hours (4-16 hours)	A. Vomiting, nausea, occasional diarrhea (Heat-stable enterotoxin) B. Diarrhea (watery), abdominal cramps (Heat-labile enterotoxin)	A. Boiled or fried rice B. Custards, sauces, meat loaf, cereal products, refried beans, dried potatoes
Campylobacter jejuni	2-5 days (1-10 days)	Abdominal cramps (often severe), diarrhea, bloody diarrhea, fever, headache	Poultry, unpasteurized milk, water, raw clams
Clostridium botulinum	12-48 hours (2 hours -8 days)	Acute bilateral cranial nerve impairment and descending weakness or paralysis; usually preceded by blurred or double vision, difficulty swallowing, dry mouth, vomiting and constipation	Canned low-acid foods, smoked fish, cooked potatoes, marine mammals
Clostridium perfringens	10-12 hours (6-24 hours)	Diarrhea (watery), colic, nausea and gas (Vomiting and fever are uncommon and symptoms usually resolve within 24 hours).	Inadequately heated or reheated meats, meat pies, stews, gravy, sauces, refried beans
Escherichia coli (Enteroinvasive or Enterotoxigenic)	10-12 hours (Heat-stable toxin) 10-12 hours (Heat-labile toxin)	Profuse watery diarrhea without blood or mucus, abdominal cramping, vomiting, low-grade fever and dehydration	A. Uncooked vegetables, salads, water
E. coli 0157:H7 (Enterohemorrhagic)	48-96 hours (up to 10 days)	Bloody or non-bloody diarrhea, severe abdominal cramps and occasional vomiting; fever infrequent	B. Undercooked ground beef and beef, raw milk, soft cheese, water
Salmonella spp. (Non-typhoid)	18-36 hours (12-72 hours)	Acute enterocolitis, diarrhea, fever, nausea, abdominal cramps, headache, occasional vomiting.	Poultry, egg products, meat, unpasteurized milk
Salmonella typhi	3 days - 3 months (1-3 weeks)	Insidious onset of fever, headache, malaise, constipation or diarrhea, anorexia	Fecally contaminated foods such as shellfish, raw fruits, and water
Shigella	24-72 hours (12-96 hours)	Diarrhea, fever, nausea, vomiting, tenesmus, severe abdominal cramping	Fecally contaminated foods such as salads, cut fruit and water
Staphylococcus aureus	2-4 hours (1-8 hours)	Sudden onset of severe abdominal cramps, nausea, vomiting, diarrhea, chills, headache, weakness, dizziness	Ham, meat & poultry, cream filled pastries, custard, high protein leftover foods
Vibrio cholerae 01 or 0139	24-72 hours (few hours - 5 days)	Sudden onset of profuse watery diarrhea, rapid dehydration, vomiting	Raw fish or shellfish, crustacea, water, fecally contaminated foods
Vibrio cholerae non-01		Watery diarrhea, vomiting	
Vibrio parahaemolyticus	12-24 hours (4-96 hours)	Watery diarrhea, abdominal cramps, nausea, vomiting, fever, headache	Marine fish, shellfish, crustacea (raw or contaminated)
Vibrio vulnificus	24-48 hours	Fever, nausea, abdominal cramps and muscle aches; often leads to septicemia in immunocompromised persons	raw oysters

Table 10A. Criteria for confirmation of viral agents responsible for foodborne and waterborne illness.

Etiologic Agent	**Incubation Period** Average (Range)	**Clinical Syndrome**	**Characteristic Foods**
Hepatitis A virus	28-30 days (15-50 days)	Acute febrile illness with anorexia, fever, abdominal discomfort, nausea, jaundice	Fecally contaminated cold foods or water, raw shellfish
Calicivirus ("Norwalk-like" or small round structured viruses)	24-48 hours (10-96 hours)	Nausea, vomiting (often projectile), diarrhea, abdominal cramps, muscle aches, headaches, low-grade fever	Fecally contaminated cold foods or water, oysters or clams, frostings

Table 11A. Criteria for confirmation of parasitic agents responsible for foodborne and waterborne illness.

Etiologic Agent	**Incubation Period** Average (Range)	**Clinical Syndrome**	**Characteristic Foods**
Cyclospora cayetanensus	7 days (1-11 days)	Fatigue, protracted watery diarrhea, often relapsing	Fecally contaminated fruits, produce or water
Cryptosporidium parvum	7 days (2-12 days)	Profuse watery diarrhea, abdominal cramps, nausea, low-grade fever, anorexia, vomiting	Fecally contaminated fruits, produce or water
Entamoeba histolytica	2-4 weeks (few weeks - several months	Illness of varying severity ranging from mild chronic diarrhea to fulminant dysentery	Fecally contaminated fruits, produce or water
Giardia lamblia	7-10 days (2-25 days)	Diarrhea, abdominal cramps, bloating, weight loss, malabsorption; infected persons may be asymptomatic	Fecally contaminated fruits, produce or water
Trichinella spiralis	8-15 days (5-45 days)	Initially diarrhea, nausea, vomiting, abdominal discomfort, muscle aches, edema of the eyelids; variable symptoms depending on the number of larvae ingested	Undercooked pork or bear meat

Table 12A. Criteria for confirmation of other agents responsible for foodborne and waterborne illness.

Etiologic Agent	**Incubation Period** Average (Range)	**Clinical Syndrome**	**Characteristic Foods**
Heavy metals (antimony, cadmium, copper, iron, tin, zinc)	Usually < 1 hour (5 minutes - 8 hours)	Compatible clinical syndrome - usually gastroenteritis with metallic taste	High acid foods/beverages stored or prepared in containers coated, lined, or contaminated with the offending metal
Scombroid fish poisoning	Usually < 1 hour (1 minute - 3 hours)	Flushing, headache, dizziness, burning of mouth and throat, upper and lower gastrointestinal symptoms, urticaria and generalized pruritis	Temperature abused fish (especially tuna, mahi-mahi, mackerel, bluefish)
Ciguatoxin	2-8 hours (1-48 hours)	Gastrointestinal symptoms followed by neurologic manifestations, including pricking or burning sensation of lips, tongue or extremities, reversal of hot/cold sensations	Fish (especially snapper, grouper, amberjack)
Paralytic shellfish poisoning (PSP)	30 minutes - 3 hours	First symptoms include tingling and numbness of lips and mouth, spreading to adjoining parts of face; symptoms vary depending on type, amount and retention of toxins in the body	Shellfish
Mushroom poisoning	6-24 hours (1-24 hours)	Initially nausea, vomiting, watery diarrhea which may progress to liver failure and death	Mushrooms (usually of the genus *Amanita*)
Monosodium glutamate poisoning	Usually < 1 hour (3 minutes - 2 hours)	Burning sensation in chest, neck, abdomen or extremities, sensations of lightness and pressure over face, or heavy feeling in the chest	Food containing large amounts of MSG (usually >1.5g)

Table 9B. Criteria for confirmation of bacterial agents responsible for foodborne and waterborne illness.

Etiologic Agent	Laboratory and Epidemiologic Criteria for Confirmation	Specimen	WSLH Kit #
Bacillus cereus	Isolation of 10^6 *B. cereus*/gm of implicated food, **OR** Isolation of *B. cereus* from stool of ill person.	5-50 g stool	Kit # 10
Campylobacter jejuni	Isolation of *C. jejuni* from implicated food, **OR** Isolation of *C. jejuni* from stool or blood of ill person.	15 ml stool	Kit # 10
Clostridium botulinum	Detection of *C. botulinum* toxin from implicated food, **OR** Detection of *C. botulinum* toxin from human sera, or feces, **OR** Isolation of *C. botulinum* from stool of persons with clinical syndrome, **OR** Consistent clinical syndrome in persons known to have eaten same food as persons with laboratory proven cases.	25-50 g stool	sterile, leak-proof container
Clostridium perfringens	Isolation of $>10^5$ *C. perfringens*/gm of implicated food, **OR** Isolation of *C. perfringens* in stool of ill persons, **OR** Detection of enterotoxin by latex agglutination (from stool extracts of culture isolates).	5-50 g stool	Kit # 10
Escherichia coli (Enteroinvasive or Enterotoxigenic) *E. coli* 0157:H7 (Enterohemorrhagic)	Demonstration of *E. coli* of same serotype in implicated food and stools in persons, **OR** Isolation of *E. coli* of the same serotype shown to be enterotoinvasive or enterotoxigenic from stool of ill persons, **OR** Demonstration of *E. coli* isolates from stools that are enterotoxigenic or enterohemorrhagic.	15 ml stool	Kit # 10
Salmonella spp. (Non-typhoid)	Isolation of *Salmonella* from implicated food or water, **OR** Isolation of *Salmonella* from stool from ill persons.	15 ml stool	Kit # 10
Salmonella typhi	Isolation of *S. typhi* from blood, stool or other clinical specimens.	15 ml stool	Kit # 10
Shigella	Isolation of *Shigella* from implicated food, **OR** Isolation of *Shigella* from stool of ill persons.	15 ml stool	Kit # 10
Staphylococcus aureus	Isolation of an enterotoxin producing strain of *S. aureus* in implicated food, **OR** Isolation of enterotoxin producing strain of *S. aureus* from stool of ill persons	5-50 g stool	Kit # 10
Vibrio cholerae 01 or 0139 *Vibrio cholerae* non-01	Isolation of toxigenic *V. cholerae* 01 or 0139 from implicated food, **OR** Isolation of *V. cholerae* 01 or 0139 from stool or vomitus of ill persons, **OR** Significant rise (fourfold) in vibriocidal antibodies. Isolation of *V. cholerae* non-01 from stool of ill person. Isolation of *V. cholerae* non-01 from implicated food is supportive evidence.	15 ml stool	Kit # 10
Vibrio parahaemolyticus	Isolation of 10^5/g *V. parahaemolyticus* from implicated food (usually seafood), **OR** Isolation of V. *parahaemolyticus* from stool of ill persons.	15 ml stool	Kit # 10
Vibrio vulnificus	Isolation of *V. vulnificus* from blood of ill persons.	Blood	Sterile Container

Table 10B. Criteria for confirmation of viral agents responsible for foodborne and waterborne illness.

Etiologic Agent	Laboratory and Epidemiologic Criteria for Confirmation	Specimen	WSLH Kit #
Hepatitis A virus	Positive anti-HAV IgM test, **OR** Liver function tests compatible with hepatitis in persons who ate the implicated food.	3 ml serum or 7ml vacutainer, no additives	Kit # 22
Calicivirus ("Norwalk-like" or small round structured viruses)	Diagnosed is often based on symptoms, onset times, and ruling out other enteric pathogens, **OR** Identification of virus in stool by polymerase chain reaction (PCR), **OR** Positive detection (Electron microscopy) of virus in vomitus or stool in ill persons or serology. (Only done with high risk groups in enclosed populations)	5-50 g raw stool in sterile container	Prior arrangements must be made through DOH and WSLH

Table 11B. Criteria for confirmation of parasitic agents responsible for foodborne and waterborne illness.

Etiologic Agent	Laboratory and Epidemiologic Criteria for Confirmation	Specimen	WSLH Kit #
Cyclospora cayetanensus	Demonstration of *C. cayetanensus* in stool of two or more ill persons.	Walnut-sized stool	Kit # 3 or 10% formalin
Cryptosporidium parvum	Isolation of *C. parvum* oocysts from implicated food, **OR** Isolation of *C. parvum* oocysts from stool of ill persons**, OR** Demonstration of *C. parvum* in intestinal fluid, or small bowel biopsy specimens, **OR** Demonstration of *C. parvum* antigen in stool by a specific immunodiagnostic test (e.g., enzyme-linked immunosorbent assay (ELISA).	Walnut-sized stool	Kit # 3 or 10% formalin
Entamoeba histolytica	Isolation of *E. histolytica* from stool of ill persons, **OR** Demonstration of *E. histolytica* trophozoites in tissue biopsy, culture or histopathology	Walnut-sized stool	Kit # 3 or 10% formalin
Giardia lamblia	Isolation of *G. lamblia* cysts from implicated food or water, **OR** Isolation of *G. lamblia* from stool of ill persons, **OR** Demonstration of *G. lamblia* trophozoites in duodenal fluid or small bowel biopsy, **OR** Demonstration of *G. lamblia* antigen by specific immunodiagnostic test (e.g., direct fluorescent antigen (DFA)).	Walnut-sized stool	Kit # 3 or 10% formalin
Trichinella spiralis	Detection of *T. spiralis* from muscle biopsy from ill person, **OR** Fourfold change or positive serologic test, **OR** Demonstration of *T. spiralis* in implicated food, OR Associated cases are confirmed if patient ate epidemiologically linked meal and is clinically compatible.	Tissue or serum	Sterile container

Table 12B. Criteria for confirmation of other agents responsible for foodborne and waterborne illness.

Etiologic Agent	Laboratory and Epidemiologic Criteria for Confirmation	Specimen	WSLH Kit #
Heavy metals (antimony, cadmium, copper, iron, tin, zinc)	Demonstration of high concentrations of metallic ion in implicated food or beverage (e.g., >400 ppm for tin).	*	*
Scombroid fish poisoning	Demonstration of elevated histamine levels (>50mg/100g) in implicated fish, cheese, or other food, **OR** Clinical syndrome in persons known to have eaten fish of Order Scombrodei or types of fish previously associated with scombroid poisoning (e.g., mahi-mahi, tuna, bluefish).	*	*
Ciguatoxin	Demonstration of ciguatoxin in implicated fish, **OR** Clinical syndrome in persons who have eaten a type of fish previously associated with ciguatera poisoning (e.g., amberjack, snapper, grouper).	*	*
Paralytic shellfish poisoning (PSP)	Detection of toxin in implicated mollusks, **OR** Detection of large numbers of shellfish poisoning-associated species of dinoglagellates in water from which implicated mollusks were gathered.	*	*
Mushroom poisoning	Demonstration of toxic chemical in implicated mushrooms, **OR** Epidemiologically implicated mushrooms identified as toxic.	*	*
Monosodium glutamate poisoning	History of ingesting implicated foods containing large amounts of MSG (usually >1.5g).	*	*

* If an outbreak involves any of the agents listed on Table 4A/4B, immediately contact the DOH or WSLH and receive instructions as to which specimens to collect, how to transport these specimens and to which specialty laboratories they should be sent.

APPENDIX B

Contact Agencies and Personnel

Table 13. WI Division of Health contacts for FBOs and WBOs.

Agency	Contact Person	Telephone / Fax / E-mail	When to Contact
WISCONSIN DIVISION OF HEALTH (DOH) - BUREAU OF PUBLIC HEALTH			
A. Regional Directors			**Immediately Contact regarding all FBO/WBOs**
Southern Region (Madison)	Mary Young	608 / 243-2360 608 / 243-2365 F youngmr@dhfs.state.wi.us	
Southeastern Region (Milwaukee)	Robert Harris	414 / 227-4910 414 / 227-2010 F harrirl@dhfs.state.wi.us	
Northeastern Region (Green Bay)	Dennis Hibray	920 / 448-5220 920 / 448-5265 F hibrada@dhfs.state.wi.us	
Northern Region (Rhinelander)	Terri Timmers	715 / 365-2703 715 / 365-2705 F timmetc@dhfs.state.wi.us	
Western Region (Eau Claire)	Larry Gilbertson	715 / 836-2871 715 / 836-6686 F gilbelm@dhfs.state.wi.us	
B. Regional Public Health Sanitarians			**Outbreaks involving the following: hotels, restaurants, camps, vending machines, campgrounds, public swimming pools, and bed & breakfast establishments.**
Southern Region		608 / 243-2351	
Southeastern Region		414 / 227-4910	
Northeastern Region		920 / 448-5223	
Northern Region		715 / 365-2700	
Western Region		715 / 836-5362	
C. Communicable Disease Section (CDS)			**All FBOs and WBOs.**
	Pam Hazlett, Program Asst.	608 / 267-7321 hazlepj@dhfs.state.wi.us	
	John Archer	608 / 267-9009 archejr@dhfs.state.wi.us	
	Tom Haupt	608 / 266-5326 hauptte@dhfs.state.wi.us	
	Jim Kazmierczak	608 / 266-5124 kazmijj@dhfs.state.wi.us	
	Mary Proctor, Supervisor	608 / 267-9005 proctme@dhfs.state.wi.us	
D. Environmental Epidemiology Prevention Section (EEPS)			**Outbreaks involving chemical contamination of food or water**
	Henry Anderson	608 / 266-1253 anderha@dhfs.state.wi.us	
	Tom Sieger	608 / 264-9880 siegetl@dhfs.state.wi.us	
	Tom Anderson	608 / 266-7089 andertn@dhfs.state.wi.us	
	Linda Knobeloch	608 / 266-0923 knobelm@dhfs.state.wi.us	

For true emergencies during non-office hours and if unable to reach an appropriate staff member, contact the **DHFS 24-Hour Emergency Hotline at (608) 258-0099**. Please provide the following information: type of location of incident, your name and the name of your agency or facility, and a telephone number where you can be reached.

Table13. WI Division of Health contacts for FBOs and WBOs. (Cont'd.)

Agency	Contact Person	Telephone / E-mail	When to Contact
D. Environmental Epidemiology Prevention Section (EEPS) (Cont'd.) Central Office Environmental Sanitation Unit			**When local sanitarian is not available.**
	Edward Rabotski	608 / 266-8294 raboteg@dhfs.state.wi.us	
	Paul Claflin	608 / 266-8336 clafp@dhfs.state.wi.us	
	Liz Temple	608 / 266-8018 templea@dhfs.state.wi.us	
E. Wisconsin Division of Support Living / Bureau of Quality Assurance (BQA)			**Any outbreak involving a hospital, nursing home, or other health care facility licensed by the DOH.**
Madison		608 / 267-7185	
F. Wisconsin Dept. of Public Instruction (DPI)			**Any outbreak involving a public or private school (preschool through high school).**
Madison	Rich Mortenson	608 / 267-9121 mortera@mail.state.wi.us	

Table 14. WI State Laboratory of Hygiene contacts for FBOs and WBOs.

Agency	Contact Person	Telephone / E-mail	When to Contact
WISCONSIN STATE LABORATORY OF HYGIENE (WSLH)			**Contact before sending food, water, or stool specimens for analysis.**
Microbiology Section			
Food Bacteriology	Linda Kelly	608 / 262-1616 lek@slh.wisc.edu	
	Marge Hamacher	608 / 262-1616 mph@slh.wisc.edu	
Environmental Science Section			
Water Bacteriology	Jon Standridge	608 / 224-6209	
	Sharon Kluender	608 / 224-6262	
Inorganic Chemistry	George Bowman	608 / 224-6278	
Virology Section			
Virology	Carol Kirk	608 / 262-3185 cjk@slh.wisc.edu	
Environmental Virology	Dave Battigelli	608 / 224-6238	

Table15. WI Dept. of Agriculture, Trade & Consumer Protection contacts for FBOs.

Agency	Contact Person	Telephone / E-mail	When to Contact
WISCONSIN DEPT. OF AGRICULTURE, TRADE AND CONSUMER PROTECTION (DATCP) / DIVISION OF FOOD SAFETY			**If suspect illness is caused by a commercial food product (dairy, processed food, poultry) whether illness is microbiological or chemical.**
Central Office:			
	Mike Barnett	608 / 224-4716 barneme@wheel.datcp.state.wi.us	
	Wayne Kopp	608 / 224-4718 koppwa@wheel.datcp.state.wi.us	
	Tom Lietzke	608 / 224-4711 lietzct@wheel.datcp.state.wi.us	
Alternate contact: Food and Dairy	John Dresser	608 / 224-4715 dressjr@wheel.datcp.state.wi.us	
	Neal Sanders	608 / 224-4713 sandene@wheel.datcp.state.wi.us	
Meat	Terry Burkhardt	608 / 224-4725 burkhtl@wheel.datcp.state.wi.us	
	Jim Larsen	608 / 224-4729 larsoja@wheel.datcp.state.wi.us	
Regions:			
Madison	Gary Bauer	608 / 224-4662 bauergj@wheel.datcp.state.wi.us	
Green Bay	Peter Klein	920 / 448-5102 kleinpe@cottge.datcp.state.wi.us	
Altoona	Ray Cress	715 / 839-3842 cressrh@.swiss.datcp.state.wi.us	

Table 16. WI Dept. of Natural Resources contacts for WBOs.

Agency	Contact Person	Telephone / E-mail	When to Contact
WISCONSIN DEPT. OF NATURAL RESOURCES (WDNR)			**Any outbreak related to drinking water, or there is poor quality public or private drinking water.**
Central Office:			
Private Water Supply	Bill Rock	608 / 267-7649 rockw@dnr.state.wi.us	
Public Water Supply	Bob Baumeister	608 / 266-2299 baumer@dnr.state.wi.us	
Regions:			
South Central	Del Maag	608 / 275-3302 maagd@dnr.state.wi.us	
Southeast	Greg Pilarski	414 / 229-0866 pilarg@dnr.state.wi.us	
Northeast	Bob Barnum	920 / 492-5888 barnur @dnr.state.wi.us	
Northern	Dave Herrick	715 / 635-4066 herrid@dnr.state.wi.us	
West Central	Larry Schaefer	715 / 839-3745 schael@dnr.state.wi.us	

Table 17. U.S. Food & Drug Administration contacts for FBOs.

Agency	Contact Person	Telephone / E-mail	When to Contact
U.S. FOOD & DRUG ADMINISTRATION (USFDA)			**If botulism is suspected, any source. Illness caused by commercial food or drug product, particularly if interstate product. Illness or injury caused by cosmetics.**
Regions:			
Madison	Charles Cote	608 / 264-5332 ccote@ora.fda.gov	
Milwaukee		414 / 771-7167 x 11	
Green Bay	Gerald Scholze	920 / 433-3924 gscholze@ora.fda.gov	
La Crosse	William Keer	608 / 785-9950 wkeer@ora.fda.gov	
Minneapolis	Dirk Mouw	612 / 334-4100 x 184 dmouw@ora.fda.gov	

APPENDIX C

Collection of Clinical Samples

A. Collection of Clinical Samples

One of the most important factors in the identification of etiologic agents responsible for foodborne or waterborne disease outbreaks is the collection of clinical samples as early in the course of the investigation as possible. This is especially true for those agents which may only be shed for several days such as *Clostridium perfringens*, *Bacillus cereus* or *Staphylococcus aureus*. Therefore, it is very important that the LHD contact the WSLH. The laboratory staff can provide information on the types of specimens and timeliness of sample collection for these various agents. The LHD should let the WSLH know the name of the outbreak (preceded by the county name) so that all associated clinical and environmental samples can be identified and located under the same identifying name. It is also important for the laboratory to be aware of these samples because several of these agents require special plating media which may need to be prepared before the samples reach the laboratory.

Inability to collect clinical samples early in the investigation may be a contributing factor in the large number (54%) of foodborne outbreaks in which an etiologic agent goes undetected. Early collection of clinical samples is especially important if the agent causes a disease of short duration (e.g., *B. cereus*, *C. perfringens*, *S. aureus*, viral outbreaks) because the numbers of organisms is drastically reduced and thus detection is impaired. As people start feeling better, they are more reluctant to submit clinical samples such as stool specimens.

B. Clinical Samples

For most food and waterborne outbreaks characterized by gastrointestinal illness, stool samples, rectal swabs and vomitus can be cultured. Collect clinical specimens (usually stools) from **up to 10** ill cases for laboratory analysis of enteric pathogens. The amount of sample required for bacterial testing is less than for parasites. For parasite testing a walnut-sized portion of stool is submitted in formalin. For bacterial testing, about 15 ml. of stool will suffice. Do not overfill, follow the directions on the specimen container. Rectal swabs are not preferred.

APPENDIX D

Collection and Handling of Food Samples

A. Food sampling

1. Food specimens are generally tested only after a foodborne pathogen or its toxin is recovered from clinical patient specimens. However, suspected foods should be collected and stored at the LHD prior to results of patient specimens. Foods should be stored refrigerated, **not frozen**, unless food was already frozen at the suspected establishment. Freezing causes significant loss of viability for certain organisms. Contact the WSLH at (608) 262-1616 as soon as a FBO is suspected to inform WSLH staff of the situation and for consultation regarding specimen collection and testing.

2. If available, the sanitarian or LHD staff should obtain a sample of the implicated food(s). If none is available, obtain an associated sample (same lot or batch).

3. If the volume of the implicated food sample is less than 200 grams (½ lb.), the whole sample should be collected and submitted in its original container. (BE SURE THAT THE CONTAINER IS LEAKPROOF!). If the volume of sample is greater than 200 grams, obtain a 200 gram sample. Sampling should be representative (i.e., taken from food throughout the sample, not just one portion of the sample).

4. Samples should be labeled with the name of the outbreak or establishment where the sample was collected, type of specimen, time and date of collection, and the investigating official's initials. All food samples should be held under refrigeration at the LHD until clinical specimens have been tested. If clinical samples on case patients are negative, food samples will not routinely be tested.

5. If the sample being submitted is a commercial food, the name of the manufacturer or processor, code or lot number, and other identifying characteristics are important. It is prudent to submit the original food container. Commercial food products should be submitted to the DATCP laboratory.

6. If a clinical specimen from at least one ill individual is positive for a foodborne pathogen, food samples should then be transported to the laboratory on ice or under refrigeration as rapidly as possible in order to maintain the population of organisms present.

7. If food kit #32 is not available, an insulated container with frozen kool-pacs or ice cans should be used when shipping samples to the laboratory. Samples should be shipped by Priority Mail or Overnight Express Mail. Packages received at the local post office by late afternoon or evening must be sent by Overnight Express Mail to guarantee next day delivery. Food samples collected on Friday may be held under refrigeration until the following Monday. Consult WSLH regarding any questions on transporting or holding of food samples.

   NOTE: Generally, all clinical or food specimens from a suspected outbreak are sent to the WSLH. Exceptions would include food specimens that are commercially produced, raw meats, or specimens from food when heavy metals or poisons are suspected to be the agent. These samples

would be sent to the DATCP food laboratory. Before forwarding specimen to the DATCP laboratory, the outbreak should be discussed with CDS staff.

B. Common factors contributing to FBOs

1. Improper holding temperature.
   - Inadequate cooling of food.
   - Improper heating of food during holding.

2. Inadequate time and/or temperature during cooking of foods.

3. Poor personal hygiene or infected persons handling foods which are not subsequently heat-processed before being eaten.

4. Lapse of 12 hours or more between preparing and serving food.

5. Cross-contamination and contaminated equipment.

6. Improper storage of foods.

7. Poor hand washing by food employees.

C. Determination of tests

The information that will be most helpful to the laboratory as a guide in selecting which tests to run in analyzing food samples are:

1. Summary of signs and symptoms (s/sx) among cases and which predominate, if any.

2. The time interval (range and the mean) between consumption of the suspect food and onset of illness (incubation period).

3. Duration of symptoms (range and the mean). This may not always be known early in the investigation since people may still be experiencing symptoms.

4. Result(s) of any human specimens collected (especially those tested by labs other than the WSLH).

5. How and when suspect food was prepared and subsequent holding temperatures and storage.

NOTE: Laboratory procedures for the isolation of microbial foodborne disease agents are complicated and time consuming. It is important that the laboratory has good epidemiologic information before analyzing food samples to insure a proper analysis.

D. Laboratory testing and interpretation

1. With some microbial agents of foodborne disease, it is necessary that large numbers of the organism be present in a food for it to be hazardous. Examples of these agents would be: *Bacillus cereus, Clostridium perfringens* and *Staphylococcus aureus.* Usually 10^6 organisms per gram of food are necessary before there is a danger of food poisoning from these agents. For these kinds of agents the laboratory reports the number of organisms present per gram of food, and whether or not this would be considered a significant level. If *S. aureus* is identified, the laboratory will also examine the isolates for enterotoxin production.

2. With other bacteria, any number of organisms present in a ready-to-eat food may be significant. Examples of such agents are *Salmonella*, *Shigella*, *Campylobacter*, and *Yersinia*. For these kinds of agents, the laboratory reports their presence or absence. Their presence in a ready-to-eat food should be considered significant.

E. Food sample kit (Kit #32, WSLH)

1. Mailing Container and Contents:
   a) Mailing Container (Styrofoam interior, corrugated carton exterior).
      Measurements: O.D. = 15" x 15" x 15"
      I.D. = 11" x 11" x 11" Quantity: 1
   b) Kool-pacs - large (8" x 8" x 1 1⁄2") Quantity: 2
   c) Sterile disposable sample scoops Quantity: 8
   d) Whirl-pac bags - sterile, labeled Quantity: 10
   e) Sterile swabs / transport media Quantity: 5
   f) Instructions

2. Other Materials
   a) "*Procedures to Investigate Foodborne Illness*" IAMFES, Ames, IA, or "*Guide for Investigating Foodborne Disease Outbreaks and Analyzing Surveillance Data*" CDC, Atlanta, GA
   b) Foodborne outbreak survey forms (DOH 4142, Revised 12/94)
   c) Food preparation, sanitation, sample collecting, etc. forms
   d) WSLH Food Sample Test Requisition Sheets (M-94-1A)

3. Cost:
   One-time cost of $25.00 for each kit.

4. Replacement:
   Once the kit is used, the WSLH will restock supplies and requisition forms in the kit and return it to the LHD.

APPENDIX E

Exclusion Guidelines for Food Workers

A. Exclusion guidelines for food employees

All persons with those communicable diseases listed in Table 18 should be excluded from food preparation, handling or serving. This should also included food employees with symptoms consistent with those diseases such as diarrhea, vomiting, abdominal cramping, fever, jaundice, etc.

Table 18. Exclusion guidelines for food employees

Etiologic Agent	Recommendation for Exclusion from Food Employees
Campylobacter	Exclude until asymptomatic
Clostridium perfringens	Exclude until asymptomatic
Entamoeba histolytica	Exclude until chemotherapy is completed
E. coli 0157:H7	Exclude until 2 consecutive negative stools cultures collected at least 24 hours apart and obtained at least 48 hours after discontinuance of antimicrobial therapy
Enterotoxigenic *E. coli*	Exclude until asymptomatic
Cryptosporidium	Exclude until asymptomatic
Cyclospora	Exclude until asymptomatic
Giardia	Exclude until asymptomatic
Hepatitis A	1) Exclude for an interval extending through day 10 following onset of **jaundice** 2) Exclude for an interval extending through day 14 following onset of symptoms if **no jaundice** present
Salmonella (Non-typhoid)	Exclude until asymptomatic
Salmonella typhi	Exclude until 3 negative stools taken at least 24 hours apart and at least 48 hours after antibiotics have been stopped, and not earlier than 1 month after onset of symptoms
Salmonella typhi carriers	Exclude until 3 negative stools taken at least 1 month apart and at least 48 hours after antibiotic therapy has stopped
Shigella	Exclude until 2 consecutive negative stools cultures collected at least 24 hours apart and obtained at least 48 hours after discontinuance of antimicrobial therapy
Viral infections	Exclude until asymptomatic
Yersinia enterocolitica	Exclude until asymptomatic

These exclusion guidelines are recommendations of the Bureau of Public Health / Communicable Disease Section and are based on current scientific literature and on CDC recommendations. **Final decisions regarding exclusion of individual food workers rest with the LHD, and should be made with consideration given to the personal hygiene of the individual, the specific duties of the food worker, the nature of the food handled, and the level of hygienic conditions and supervision in the food establishment.**

B. Management of high risk contacts of cases

Table 19. Exclusion guidelines for high risk contacts of cases.

Etiologic Agent	Recommendation for exclusion of contacts in sensitive occupations (food workers, child care, health care, etc.)
Campylobacter	Exclude if symptomatic, may return once asymptomatic *
Clostridium perfringens	Exclude if symptomatic, may return once asymptomatic *
Entamoeba histolytica	Exclude if symptomatic, may return once asymptomatic *
E. coli 0157:H7	Symptomatic contacts should be excluded from sensitive occupations should be excluded until asymptomatic and 2 consecutive negative stool cultures are obtained. [1]
Enterotoxigenic *E. coli*	Exclude if symptomatic, may return once asymptomatic *
Cryptosporidium	Exclude if symptomatic, may return once asymptomatic *
Cyclospora	Exclude if symptomatic, may return once asymptomatic *
Giardia	Exclude if symptomatic, may return once asymptomatic *
Hepatitis A (HAV)	See Hepatitis A Manual (POH 4554) [2]
Salmonella (Non-typhoid)	Exclude if symptomatic, may return once asymptomatic *
Salmonella typhi	Household and close contacts should not be employed in sensitive occupations (e.g., food handlers) until at least 2 negative stool cultures, taken at least 24 hours apart are obtained. [1]
Salmonella typhi carriers	Household and close contacts should not be employed in sensitive occupations until at least 2 negative stool cultures, taken at least 24 hours apart are obtained. [1]
Shigella	Symptomatic contacts should be excluded from sensitive occupations should be excluded until asymptomatic and 2 consecutive negative stool cultures are obtained. [1]
Viral infections (not HAV)	Exclude if symptomatic, may return once asymptomatic *
Yersinia enterocolitica	Exclude if symptomatic, may return once asymptomatic *

* Return to work is at the discretion of the LHD.

1. Benenson AS, ed. Control of Communicable Diseases Manual. 16th ed. Washington, DC: American Public Health Association, 1995.
2. Hepatitis A: A Handbook for Public Health Personnel. Madison, WI: Wisconsin Division of Health, DHFS, Communicable Disease Section, 1992.

APPENDIX F

Final Report for a Foodborne Outbreak Investigation

A. Preparing a final report

PURPOSE

- To document the progression and rationale behind activities in the investigation
- To document information in case of potential legal issues
- To provide a reference for education and improve investigations and prevention methods for future outbreaks

1. Background

- What was the setting in which the problem occurred or what were the circumstances initiating the investigation? Where there any special events surrounding the outbreak?
- Who was involved in the outbreak? (Do not use names of case-patients or contacts. The names of LHD personnel or authorized personnel involved in the investigation may be included. The names of facilities or locations where FBDO/WBDOs occurred may be included at the discretion of the LHD.)
- Demographic setting (age, gender, occupation, etc.)
- How many people were ill? (Those meeting the case definition)
- How many exposed?
- What was the severity and clinical picture of cases? (e.g., # ill, # hospitalized, # fatalities, list of symptoms, unusual clinical cases or onset times)
- Where did it occur? Relevant geography (e.g., home environment, work environment, school environment)
- Is it an ongoing problem?

2. Methods

- What control methods were employed?
- What lab tests were done? What was the rationale for these tests (clinical? epidemiological?)
- How were the data analyzed? (e.g., line lists, epi-curves, EPI-Info software)
- Include a copy of the questionnaire used. Who administered questionnaire? Self-administered?

3. Results

- What did the LHD investigation report reveal? (What was the etiologic agent? What was the vehicle? What was the primary problem? Has it been resolved?)
- What did the sanitarian's report reveal (Where there environmental factors contributing to the outbreak?)
- Laboratory results (Clinical or environmental samples. Do they support the hypotheses?)
- Epi curve, charts, etc. (Indication of source? Time of exposure?)
- Statistical analysis (What sources were statistically implicated?)

4. Discussion

- Were the control measures effective and would they be effective in future outbreaks?
- Were there any important or unusual outcomes or findings?
- Assess current surveillance procedures (Are current surveillance strategies effective enough to detect a similar outbreak in the future? What methods need to be enhanced or curtailed?)
- Summarize important aspects of the investigation (What important elements were learned from this investigation that could be used by the LHD or other LHDs)

The following sections within *Appendix F* will discuss and provide examples of the components of a final report for an outbreak investigation. The narrative accompanying the "INVESTIGATION OF A FOODBORNE OUTBREAK" form (DPH 9081, CDC 52.13) provides valuable information following an outbreak investigation. As pointed out in the "*Steps in an outbreak investigation"*, page 31, narrative reports may be beneficial to the LHD by documenting the rationale for activities undertaken during the investigation, provides documentation for potential legal issues, and provides the LHD with information that can be used to improve future investigations, recognize future outbreaks and plan prevention strategies.

The narrative provides valuable information to the Wisconsin Division of Health and the Centers for Disease Control and Prevention. In addition to the information provided on the DOH 9081 form, the narrative increases the information already known about the nature of many food and waterborne diseases, their etiologic agents, vehicles of infection, and any changes in the nature of these diseases.

B. Components of a final report

1. Example of a line listing for a FBO investigation

Line list: A table listing case names, age, sex, onset time, residence, symptoms, employment, etc. which facilitates comparisons of many characteristics for possible similarities or associations.

The line list is begun early in the investigation and consists of a detailed listing of cases, line by line, and may include demographic features, occupation, special activities or any other variables which might be associated with the outbreak. Each column represents an important variable and each row represents a different case. A line list provides the data needed to construct an epi curve.

A blank table is provided for your convenience on the back side of this page.

Table 20. Example of a line listing for a FBO investigation.

No.	Initial	Age	Sex	Onset Date	Onset Time (24 HOUR)	Symptoms							
						N	V	D	AC	BA	F	HA	CH
1.	JRM	25	M	12/20	1600	+	+	+	+	+	+	+	+
2.	TEH	35	M	12/22	1900	+		+	+	+	+		
3.	TAE	60	M										
4.	JEB	48	F	12/21	0600			+	+	+	+	+	+
5.	RWH	28	M										
6.	AOL	25	F	12/20	1800	+		+	+		+		
7.	ABC	36	F	12/20	0700		+	+	+	+	+	+	+
8.	PSH	26	F										
9.	EMH	64	F										
10.	DER	38	F	12/21	0500	+		+	+		+	+	+
11.	SEM	42	F	12/21	0800	+		+	+		+	+	+
12.	JWB	33	M	12/20	0900			+		+			
13.	BAJ	56	F										
14.	TEK	52	F										
15.	PMH	48	F										
16.	MEO	58	F	12/20	2200	+	+	+	+	+	+	+	+
17.	HAH	62	F	12/20	2000	+		+	+		+	+	
18.	WAH	56	M	12/22	0700			+			+		+
19.	AMH	23	F	12/21	1100	+		+	+		+	+	
20.	MJP	36	F										
21.	JAJ	28	M	12/21	2000	+	+	+	+	+	+	+	+
22.	HJC	41	F										
23.	TEP	35	M	12/21	1800	+		+	+			+	
24.	DFS	40	M	12/20	1600			+			+		
25.	JEF	37	M										

N = Nausea, V = Vomiting, D = Diarrhea, AC = Abdominal cramping, BA = Body aches, F = Fever, HA = Headaches, CH = Chills

Line list - Name of Outbreak

No.	Initial	Age	Sex	Onset Date	Onset Time (24 HOUR)	Symptoms							
						N	V	D	AC	BA	F	HA	CH

N = Nausea, V = Vomiting, D = Diarrhea, AC = Abdominal cramping, BA = Body aches, F = Fever, HA = Headaches, CH = Chills

2. Example of an attack rate table for a FBO investigation

Attack Rate: A type of cumulative incidence rate which expresses the occurrence of a disease among a specific population at risk observed for a limited period of time, often due to a very specific exposure.

Attack rates are presented on an **attack rate table** which are used to demonstrate the association between exposure (i.e., food items) and occurrence of disease.

A blank attack rate table is provided for your convenience on the back side of this page.

Table 21. Example of an attack rate table for a FBO investigation.

Food & Drink Items Served	**# who ate specified foods**				**# who did NOT eat foods**			
	Ill	Not Ill	Total	%	Ill	Not Ill	Total	%
Hot beef	6	5	11	55	9	5	14	64
Ham	14	7	21	67	1	3	4	25
Fried chicken	11	7	18	61	4	3	7	57
Potato salad	10	9	19	53	5	1	6	83
Baked beans	7	6	13	54	8	4	12	67
Deviled eggs	**14**	**1**	**15**	**93**	**1**	**9**	**19**	**10**
Fruit salad	12	5	17	71	3	5	8	38
Cheese tray	8	5	13	62	7	5	12	58
Crackers	8	6	14	57	7	4	11	64
Pickled herring	9	3	12	75	6	7	13	46
Pasta salad	8	5	13	62	7	5	12	58
Relish tray	9	6	15	60	6	4	10	60
Cheese cake	4	3	7	57	11	7	18	61
Pumpkin bars	6	4	10	60	9	6	15	60
Bar drink with ice	7	4	11	64	8	6	14	57
Beer	6	5	11	55	9	5	14	64
Wine	2	2	4	50	13	8	21	62
Punch # 1 (with alcohol)	6	5	11	55	9	5	14	64
Punch # 2 (without alcohol)	3	2	5	60	12	8	20	60
Soda	2	2	4	50	13	8	21	62

Attack rate table

Food & Drink Items Served	**# who ate specified foods**				**# who did NOT eat foods**			
	Ill	Not Ill	Total	%	Ill	Not Ill	Total	%

3. Example of a questionnaire used for a FBO investigation

MADISON WIDGET FACTORY CHRISTMAS PARTY QUESTIONNAIRE

Demographics:
Name _____ Date of Birth: _____ / _____ / _____
Age:_____ Gender: M F
Address: _____
City: _____ County: _____ Zip: _____
Phone: (_____) _____ - _____

Ill: Y N Onset Date: ____ / ____ / ____ Onset Time (2400 hours): ____ : ____

Symptoms:
_____ Nausea
_____ Vomiting (_____ x day)
_____ Diarrhea (_____ x day) (_____ watery _____ bloody)
_____ Abdominal cramps
_____ Headache
_____ Fever (_____° F)
_____ Chills
_____ Sweats
_____ Body Aches
_____ Fatigue
_____ Other: _____

Foods Eaten: (Choices obtained from menu)
_____ Hot Beef
_____ Ham
_____ Fried chicken
_____ Potato salad
_____ Baked beans
_____ Deviled eggs
_____ Fruit salad
_____ Cheese tray
_____ Crackers
_____ Pickled herring
_____ Pasta salad
_____ Relish tray
_____ Cheese cake
_____ Pumpkin bars
_____ Other: _____

Drinks:
_____ Bar drink
_____ Beer
_____ Wine
_____ Punch #1 (with alcohol)
_____ Punch #2 (without alcohol)
_____ Soda
_____ Drink with ice
_____ Other drink: _____

Demographics:

Name _____ Date of Birth: _____ / _____ / _____

Age:_____ Gender: _____M _____F

Address: _____

City: _____ County: _____ Zip: _____

Phone: (_____) _____ - _____

Ill: Y N Onset Date: ____ / ____ / ____ Onset Time (2400 hours): ____ : ____

Symptoms:

_____ Nausea

_____ Vomiting (_____ x day)

_____ Diarrhea (_____ x day) (_____ watery _____ bloody)

_____ Abdominal cramps

_____ Headache

_____ Fever (_____° F)

_____ Chills

_____ Sweats

_____ Body Aches

_____ Fatigue

_____ Other: _____

Foods Eaten:

_____

_____

_____

_____

_____

_____

_____

_____

Drinks:

_____

_____

_____

_____

_____

Drinks with ice? Y N

4. Example of an epidemic or epi curve for a FBO investigation

Epidemic curve (Epi curve): A histogram (a type of bar graph) that shows the course of a disease outbreak by plotting the number of cases by time of onset**.** The cases are plotted along the Y axis and the time intervals are plotted along the X axis.

An epi curve may provide information regarding the magnitude of the outbreak and where you are in the time course of the outbreak. The configuration often suggests the nature of the etiologic agent, source and mode of spread. If a specific etiologic agent (with a known incubation period) is suspected or confirmed, investigators can deduce the time of exposure and develop their investigation around that time period.

The overall shape of the curve may give an indication of the source. For example, a curve having a steep slope with a gradual down slope may indicate that ill persons were exposed over a brief period of time (**point source outbreak**). An example of a point source outbreak would be a wedding, party or other event in which the outbreak is associated with a common meal.

An epi curve having a plateau of cases rather than a peak might indicate that exposure occurred over a prolonged period of time or is ongoing. This would be referred to as a **continuous common source outbreak**. An example of a continuous common source outbreak would be an outbreak associated with a restaurant in which cross contamination of food in the kitchen was extended over a number of days.

C. Considerations when reporting on an outbreak related to restaurants, weddings, or banquets

1. Eating establishments:

- Did the restaurant or eating establishment have a history of sanitation problems or food complaints?
- Did the facility maintain an accurate record of food workers missing work due to illness? Were any workers ill at the time of the outbreak? Were there illnesses in the families of food workers?
- Did the facility have a policy regarding ill food workers? Any exclusions?
- Was the schedule of staff working at the time of, or shortly before the outbreak available?
- Were disposable gloves worn by food workers?
- Where there adequate hand washing facilities available?
- Before the outbreak did the facility change the menu? Offer any specials? Unusual food items?
- Were invoices of suspect foods available and obtained in the event that tracebacks are warranted?
- Were foods prepared ahead in batches (e.g., submarine ingredients) or precooked (e.g., roasts)?
- Were foods held at room temperature before food preparation (e.g., pooled eggs for omelets)?
- Did facility use municipal or well water (If well, record of last well test available)?
- Where there opportunities for cross contamination of foods during food handling?
- Where there opportunities for cross contamination of foods in coolers (e.g., poultry dripping on lettuce)?
- Were there opportunities for cross contamination or back flow from the plumbing system?

2. Additional comments for weddings or banquets

- Is a table arrangement available? Location of buffet lines?
- How was food prepared? (In batches? Precooked portions? Uniform cooking facilities? How long were foods held before serving?, etc.)
- Was food left out on the buffet tables? How long?
- Were meals cooked in-house or catered? (If catered, see restaurant recommendations)
- Are there any leftover food items available?
- Can illnesses be linked to rehearsal dinner? (Location? Time? Foods? etc.)
- Were there any other social events in conjunction with the wedding or banquet? (e.g., happy hour, hotel parties, brunches)
- Hotel arrangements? (foods, parties, swimming pool or whirlpools, room numbers, ice machines, etc.)

D. Examples of final reports

1. Example 1. "Dane - Widget factory" FBO final report

Outbreak:	**Dane County - Christmas Party**
Location:	**Madison Widget Factory, Madison, WI**
Event:	**Office Christmas Party & Pot Luck Dinner**
Date of event:	**December 19, 1997**
Onset of illness:	**December 20, 1997**
# Laboratory confirmed cases:	**10**
# Cases meeting case definition:	**15**
# Exposed:	**25**
Etiologic agent:	***Salmonella enteritidis* (Phage type 08)**
Vehicle:	**Deviled eggs**
Principal investigator:	**John Smith, Madison Dept. of Public Health**

Background:

On 12/19/97, an office party and pot luck dinner was held in the offices of Madison Widget Factory, 1234 Happy Days Drive, Madison, WI. The attendees were 25 office staff of the factory. Foods for the pot luck dinner included salads, casseroles, meat dishes and desserts. The party began at 5:00 PM. The foods were set out around 5:00 PM, but were not eaten until around 8:00 PM. Foods remained on the serving table until the party ended at 10:00 PM.

On 12/22/97, the Madison Department of Public Health (MDPH) began receiving calls from area clinics regarding a number of apparent food poisoning cases possibly related to an office Christmas party. Symptoms were characterized by nausea, diarrhea, abdominal cramping, body aches and fever. S*almonella* was isolated from one of the office staff at a local clinic and sent to the Wisconsin State Laboratory of Hygiene (WSLH) for serotyping. The MDPH contacted each attendee and followed up symptomatic cases. Stool samples were collected from 9 additional symptomatic employees.

Methods:

1. Epidemiologic Investigation:

Case definition: A probable case was defined as an illness (1) in a person who attended the Widget Factory Christmas Party on 12/19/97, (2) with onset of illness within 72 hours of the meal, and (3) with diarrhea (three or more stools in a 24 hour period) and at least two of the following symptoms: abdominal cramping, nausea, headache, fever. A laboratory-confirmed case was defined as a person with positive stool for *Salmonella enteritidis*.

2. Control and Prevention Strategies:

After it was apparent the cluster of illness was associated with attendance at the office party, the MDPH nurse and sanitarian met with the entire office staff and discussed good personal hygiene, thorough hand washing, the potential of secondary infections to household contacts of infected persons and proper food handling and storage procedures. The MDPH also distributed *Salmonella* Disease Fact Sheets to all the office staff members.

A line list was created to identify and characterize cases by interviewing office staff that attended the Christmas Party on 12/19/97. (See attached sheet) An epi-curve was constructed to determine the magnitude and status of the outbreak and incubation periods. (See attached sheet) A questionnaire was designed and a case-control study was conducted among attendees to assess any association between consumption exposure to foods served at the party and disease (See attached sheet). All 15 symptomatic and 10 asymptomatic party attendees were interviewed by the MDPH. Statistical analysis of the case-control data was done using Epi-Info Version 6.04.

3. **Laboratory Analysis:**
   Stool specimens for bacterial enteric cultures were obtained from 10 symptomatic office staff and sent to the WSLH and two *Salmonella enteritidis* isolates were sent to the CDC for phage typing.

Results:

1. **Control and Prevention:** No additional cases or secondary cases were reported from the party attendees or their household contacts.

2. **Epidemiologic Investigation:** Fifteen of the 25 office staff were symptomatic and met the case definition. The attack rate among attendees was 60%. The illness was characterized by diarrhea (15), fever (13), abdominal cramping (12), nausea (10), headache (10), chills (8), body aches (7) and vomiting (4). The incubation periods ranged from 11-71 hours (average = 33.5) and the duration of illness ranged from 20-168 hours (average = 89.9 hours). The epi-curve suggested a single point source exposure. The case-control study epidemiologically associated the deviled eggs as the vehicle most likely responsible for the outbreak. The deviled eggs were implicated statistically (O.R. = 126; 95% C.I. = 5.1 - 19322; and p-value = <0.0001).

   The person that prepared the deviled eggs stated the eggs were prepared the night before the party and refrigerated overnight. The recipe was doubled. The eggs were “not fully hard boiled”. (Recipe and method of preparation listed on separate sheet.) The day of the party the eggs were placed in a refrigerator at work but were removed during the noon lunch and inadvertently left out for several hours until an office staff noticed them on top of the refrigerator during the afternoon break (14:30). The eggs were then returned to the refrigerator. The eggs were purchased from a local grocer. The grocer was contacted by the MDPH to obtain invoices of eggs purchased by the grocer during two weeks before purchase of the eggs in question. The invoices were sent to the CDS and forwarded to the Wisconsin Department of Agriculture, Trade & Consumer Protection (DATCP), Food Safety Division for a possible egg traceback investigation.

3. **Laboratory Analysis:**
   Salmonella enteritidis was isolated from the 10 symptomatic staff who submitted stool samples. Two isolates sent to CDC were identified as *"Salmonella enteritidis Phage Type 08"*.

Discussion:

This outbreak identified 15 cases, 10 of which were laboratory-confirmed *Salmonella enteritidis* infections, of which two were phage type 08. Company implemented safe "in-house" food handling procedures for storage of foods and no additional cases have been reported.

The only food item with a statistically significant association with illness were the deviled eggs. There may have been temperature abuse of the eggs in the hours preceding the party. This outbreak stresses the need for vigilance in maintaining proper temperature control in dealing with high risk foods such as eggs or egg-related dishes, and the importance of educating the general population about food safety measures.

Deviled Eggs Recipe

Deviled Eggs:

6 hard-cooked eggs, peeled and halved lengthwise
3 tablespoons mayonnaise
1 tablespoon Dijon mustard
1/8 teaspoon salt
Paprika, for sprinkling

With a small spoon lift egg yolks out of whites. Place yolks in small bowl. Add mayonnaise, mustard and salt to egg yolks; mix well with a fork to make a very smooth paste. Adjust seasonings, if necessary. Arrange egg white halves on a serving platter. Mound some of yolk mixture into each and sprinkle with paprika. Serve immediately or store, covered, in refrigerator until ready to use.

Makes 1 dozen Deviled Eggs

Attack rate table for "Dane - Widget Factory" FBO investigation

Food & Drink Items Served	**# who ate specified foods**				**# who did NOT eat foods**			
	Ill	Not Ill	Total	%	Ill	Not Ill	Total	%
Hot beef	6	5	11	55	9	5	14	64
Ham	14	7	21	67	1	3	4	25
Fried chicken	11	7	18	61	4	3	7	57
Potato salad	10	9	19	53	5	1	6	83
Baked beans	7	6	13	54	8	4	12	67
Deviled eggs	**14**	**1**	**15**	**93**	**1**	**9**	**19**	**10**
Fruit salad	12	5	17	71	3	5	8	38
Cheese tray	8	5	13	62	7	5	12	58
Crackers	8	6	14	57	7	4	11	64
Pickled herring	9	3	12	75	6	7	13	46
Pasta salad	8	5	13	62	7	5	12	58
Relish tray	9	6	15	60	6	4	10	60
Cheese cake	4	3	7	57	11	7	18	61
Pumpkin bars	6	4	10	60	9	6	15	60
Bar drink	7	4	11	64	8	6	14	57
Beer	6	5	11	55	9	5	14	64
Wine	2	2	4	50	13	8	21	62
Punch #1 (with alcohol)	6	5	11	55	9	5	14	64
Punch #2 (without alcohol)	3	2	5	60	12	8	20	60
Soda	2	2	4	50	13	8	21	62
Drink with ice added	8	6	14	57	7	4	11	64

Line listing for the "Dane - Widget Factory" FBO investigation

No.	Initial	Age	Sex	Onset Date	Onset Time	Symptoms							
					(24 HOUR)	N	V	D	AC	BA	F	HA	CH
1.	JRM	25	M	12/20	1600	+	+	+	+	+	+	+	+
2.	TEH	35	M	12/22	1900	+		+	+	+	+		
3.	TAE	60	M										
4.	JEB	48	F	12/21	0600			+	+	+	+	+	+
5.	RWH	28	M										
6.	AOL	25	F	12/20	1800	+		+	+		+		
7.	ABC	36	F	12/20	0700		+	+	+	+	+	+	+
8.	PSH	26	F										
9.	EMH	64	F										
10.	DER	38	F	12/21	0500	+		+	+		+	+	+
11.	SEM	42	F	12/21	0800	+		+	+		+	+	+
12.	JWB	33	M	12/20	0900			+		+			
13.	BAJ	56	F										
14.	TEK	52	F										
15.	PMH	48	F										
16.	MEO	58	F	12/20	2200	+	+	+	+	+	+	+	+
17.	HAH	62	F	12/20	2000	+		+	+		+	+	
18.	WAH	56	M	12/22	0700			+			+		+
19.	AMH	23	F	12/21	1100	+		+	+		+	+	
20.	MJP	36	F										
21.	JAJ	28	M	12/21	2000	+	+	+	+	+	+	+	+
22.	HJC	41	F										
23.	TEP	35	M	12/21	1800	+		+	+			+	
24.	DFS	40	M	12/20	1600			+			+		
25.	JEF	37	M										
						10	4	15	13	7	13	10	8

N = Nausea, V = Vomiting, D = Diarrhea, AC = Abdominal cramping, BA = Body aches, F = Fever, HA = Headaches, CH = Chills

"DANE - WIDGET FACTORY" CHRISTMAS PARTY QUESTIONNAIRE

Demographics:
Name _____ Date of Birth: _____ / _____ / _____
Age:_____ Gender: M F
Address: _____
City: _____ County: _____ Zip: _____
Phone: (_____) _____ - _____

Ill: Y N Onset Date: ____ / ____ / ____ Onset Time (2400 hours): ____ : ____

Symptoms:
_____ Nausea
_____ Vomiting (_____ x day)
_____ Diarrhea (_____ x day) (_____ watery _____ bloody)
_____ Abdominal cramps
_____ Headache
_____ Fever (_____° F)
_____ Chills
_____ Sweats
_____ Body Aches
_____ Fatigue
_____ Other: _____

Foods Eaten:
_____ Hot Beef
_____ Ham
_____ Fried chicken
_____ Potato salad
_____ Baked beans
_____ Deviled eggs
_____ Fruit salad
_____ Cheese tray
_____ Crackers
_____ Pickled herring
_____ Pasta salad
_____ Relish tray
_____ Cheese cake
_____ Pumpkin bars
_____ Other: _____

Drinks:
_____ Bar drink
_____ Beer
_____ Wine
_____ Punch #1 (with alcohol)
_____ Punch #2 (without alcohol)
_____ Soda
_____ Drink with ice
_____ Other drink: _____

2. The following is an example of a more abbreviated report of the same outbreak described in Example 1. "Dane - Widget factory" FBO final report

Background:

On 12/22/97, the Madison Department of Public Health (MDPH) began receiving calls about food poisoning cases possibly related to an office Christmas party. The ill persons complained about nausea, diarrhea, abdominal cramping and fever beginning about 24-48 hours after the party.

Methods:

A line list was created to identify and characterize cases by interviewing office staff that attended the party. All party attendees were interviewed by the MDPH. Stool specimens for bacterial enteric cultures were obtained from 10 ill office staff and sent to the WSLH.

The MDPH distributed *Salmonella* Disease Fact Sheets, instructed the office staff about good personal hygiene, hand washing and the potential of secondary infections to household members.

Results:

A total of 15 people were ill. The illness was characterized by diarrhea (15), fever (13), abdominal cramping (12), nausea (10), headache (10), chills (8), body aches (7) and vomiting (4).

The incubation periods ranged from 11-71 hours (average = 33.5) and the duration of illness ranged from 20 - 168 hours (average = 89.9 hours).

Salmonella Enteritidis was isolated from the 10 symptomatic staff who submitted stool samples.

The deviled eggs were placed in a refrigerator at work but were removed during lunch and left out for several hours until an office staff noticed them on top of the refrigerator during the afternoon break (14:30). The eggs were then returned to the refrigerator and later served during the party.

No additional cases or secondary cases were reported.

Discussion:

This outbreak identified 15 cases, 10 of which were laboratory-confirmed *Salmonella enteritidis* infections. Company implemented safe "in-house" food handling procedures and no additional cases have been noted.

The only food item with a statistically significant association with illness was the deviled eggs. There may have been temperature abuse of the eggs in the hours preceding the party. This outbreak stresses the need to maintain proper temperature control in dealing with high-risk foods such as eggs or egg-related dishes, and the importance of educating the general population about food safety measures.

APPENDIX G

Collection and Handling of Water Samples

A. Municipal Water Systems

1. Sample collection and handling of potable waters

Most tap water in Wisconsin is suitable for drinking and other home uses. There are, however, circumstances which can lead to contamination of water supplies, both public and private. Public water supplies are regularly tested by local municipalities for indicators of fecal pollution and toxic chemicals and must meet state and federal standards. Despite routine monitoring, problems can occur as demonstrated during the 1993 Milwaukee C*ryptosporidium* outbreak.

When an outbreak occurs and is thought to be waterborne, the involved water system should be inspected. The following should be assessed: the source of the water, the method of water treatment, recent problems with the system, recent water testing results, any recent repairs or alternations of the distribution system, and any recent power or water pressure disruptions which might have resulted in contamination through cross contamination or back-siphonage.

The identification of etiologic agents responsible for WBOs is dependent on the timely recognition of outbreaks so that appropriate clinical and environmental samples can be collected. This is often affected by the surveillance systems, interests and expertise of LHDs, and available revenues and resources. Because of this, LHDs that report the most outbreaks may not be those in whose jurisdiction the most outbreaks actually occur.

Another consideration in water sampling is timing. Samples should be collected, transported to the testing laboratory, and processed as quickly as possible after an outbreak occurs because the contamination may have been transient, and samples collected during later dates may not reflect the condition of the water when it was potentially contaminated.

The same procedures are used for collecting water samples from municipal water supplies and private wells. Sampling procedures are provided with the sample container by the WSLH, Water Microbiology Unit, but can also be used when submitting water samples to over 90 private laboratories "certified" to do bacteriological testing by the DATCP. Their telephone number is (608) 224-6262.

Chlorinated water samples

Samples of continuously chlorinated water, such as city water supplies, swimming pools and whirlpools, must be collected in a special bottle containing a chlorine neutralizing substance such as sodium thiosulfate. These special bottles are not appropriate for sampling wells that have been temporarily chlorinated. Temporarily chlorinated wells should be pumped until they are free of chlorine prior to sampling.

2. Collection of water samples for *Legionella*

A 200 ml water sample should be collected in sterile plastic bottles. If the water has been recently treated with chlorine or other halogens (e.g., bromine), sodium thiosulfate (0.5 ml of 0.1 N sodium thiosulfate) should be added as a reducing agent. Neutralization of the biocide present in a water sample at the time of collection will prevent continued bactericidal activity during transit of the sample and will allow for a more accurate determination of the number of *Legionella* present. Always notify the testing laboratory before the collection and submission of samples. If other sources are suspected, consult with CDS regarding sample collection procedures.

a) Faucets, shower heads, etc.

Shower heads and faucets with aerators or flow restrictors may become colonized with *Legionella* and are suitable for sampling if implicated. Swab specimens of faucet aerators and shower heads should be obtained before water samples from these sites. The water sample should be obtained with the aerator or shower head removed if possible.

1) Collect sample when faucet or shower head has not been used for several hours.
2) Swab the internal surfaces of faucet or shower head with sterile cotton applicator.
3) Place the swab in collection bottle and submerge with three to five ml. of water from the same source to prevent drying during transport.
4) If it is not possible to swab the inside of the faucet or shower head, collect a full bottle of water.

b) Hot water heaters

1) Collect sample from faucet at bottom of tank.
2) If possible, sterilize faucet by heating it with a flame. Let cool for several minutes.
3) Let water run for 30 seconds, then open bottle and collect sample. Fill bottle to within one inch of the top. Indicate to testing laboratory whether the faucet was sterilized before the collection of water sample.

3. Collection of water samples for chemical contamination

If an outbreak (or single case) is suspected to be chemically-induced, immediately contact the BPH, EEPS and/or the WSLH, Environmental Science Section (See Appendix B - *Contact Agencies and Personnel*). These offices should be contacted before collecting samples. It is imperative to discuss the case or investigation before collecting samples because the laboratory would need to know the type of chemical suspected to know what samples to collect, how to store the specimens, and how to ship the samples to the proper laboratory.

B. Private water systems

1. Wells

For those individuals with a private water system, usually a well, the responsibility for testing resides with the individuals who own the well site. Annual testing of wells is recommended, especially if the well is located near sources of potential contamination. Even if the water is currently safe, routine testing provides a water quality record if problems arise. Routine testing should include screening for coliform bacteria and *E. coli*, nitrates, lead, copper, and triazines.

Circumstances for which more frequent testing (both bacteriological and chemical) would be recommended include: a well located near septic fields, a dump, landfill, factory, underground storage tank, or a mining operation, intensive agriculture or livestock operations, or when a consumer of the water is pregnant. Natural disasters such as flooding may also necessitate water testing. If flooding occurs, bottled water or water brought to a "rolling boil" for one minute should be used until the well can be tested and, if necessary, disinfected. Consideration should be given to the fact that boiling water will concentrate nitrate levels if the water is to consumed by pregnant women or infants.

2. Collection of potable water from wells

a) Locate a sample tap near the well, preferably not a swing, leaky or outside faucet. Remove any screens or aerators from the tap.
b) Sterilize metal taps by heating with a flame (e.g., butane lighter, propane torch, alcohol lamp). Eliminate this step for plastic or partially plastic taps.
c) Allow the water to run for several minutes. **Do not change the flow rate, do not shut the faucet off, and do not wipe or wash the faucet prior to sample collection.**
d) Do not open the bottle until ready to collect the sample. Take care not to touch the top of the collection bottle or inside of the cap. Fill the bottle to within ½ inch of top.

3. Possible sources of bacterial contamination of wells

- Not following sampling instructions properly.
- Insects getting into the well through nonvermin-proof cap or seal or a loose well cap.
- The well casing is not properly sealed into the rock formation.
- The well casing does not terminate at least 12 inches above the ground.
- The well terminates in a nonconforming pit, which may be subject to flooding or seepage of groundwater.
- Contamination of new wells because the drill hole becomes contaminated through dirty tools, pipe and drilling water.
- Recent repairs or construction to the plumbing system may contaminate the system.
- Flooding or other natural disasters.

4. Disinfection of the well and water system

Source: Wisconsin Water Well Association

Wells may be disinfected once an inspection has determined that the water system is free from any continual contamination.

a) Mix one gallon of household laundry bleach with 100 gallons of water. If the well is more than 150 feet deep, mix two gallons of bleach with 200 gallons of water. If there is not a container large enough to mix the solution, it can be made up 25 gallons at a time in four clean plastic garbage cans.
b) Remove the cap from the well and pour the entire bleach and water solution into the well in rapid succession.
c) Rinse down the sides of the well casing with a garden hose for five to 10 minutes. The rinse water should be from a hose on the water system being disinfected. This procedure circulates the bleach through the water system to insure better disinfection.
d) If the plumbing system is to be disinfected, turn on all the cold water taps until you smell the bleach, then turn the taps off.
e) Let the bleach remain in the system for at least eight hours (preferably 24 hours).
f) Pump all the bleach out of the water system by running the water through a garden hose to an area where the bleach will not damage lawns, shrubs, or septic systems. Pump until the bleach odor is no longer apparent.
g) Two or three days after the disinfection, a water sample from the well should be submitted for bacteriological analysis. One month after the disinfection, a sample from the well should be submitted for bacteriological analysis to assure the well is maintaining safe, quality water.

C. Recreational water

1. Collection of water from beaches for bacterial enteric pathogens

a) Routine monitoring programs

In Wisconsin routine monitoring programs are established for only a portion of the state's recreational beaches. The need for such programs are established locally and generally include:

- **Sample sites** (sites with high beach usage, sites exposed to frequent runoff problems, sites with historic pollution problems)
- **Frequency of sampling** (5 samples/site for a 30 day period)
- **Duration of sampling season** (June 1 through September 1)
- **Sample depth** (just below water surface, in ankle-to-knee deep water)
- **Sampling kits** (containing sterile collection bottles, instructions, shipping instructions, lab slips, and directions regarding repeat sampling)
- **Tests for indicator organisms** (*E. coli* and *Enterococcus*)

b) Monitoring following events with potential pollution

In addition to routine monitoring, beach water testing may take place following events with potential pollution problems resulting in beach closings or advisories. Major pollution sources for beach closings and advisories include:

- **Polluted (urban and non-urban) runoff** containing septic wastes and sewage sludge, animal (wild and domestic) wastes, fertilizer, pesticides, gas & oil, etc.
- **Sewer spills or overflows** following heavy rains or floods.

2. Collection of water from swimming pools and whirlpools for bacterial enteric pathogens

Testing for specific pathogenic bacteria or parasites is not routinely available or practical in recreational waters such as swimming pools or whirlpools. Therefore, when investigating a WBO, water quality may be determined by testing for the presence or absence of coliform bacteria. In addition to testing following a suspected WBO, proprietors of licensed public pools are encouraged to routinely sample for bacteriologic contamination. Sample the pool during a period of average use, dependent on individual pool usage. Using a sweeping motion, collect a sample from a depth of 18 inches. Please ensure that the chlorine neutralizing substance is not rinsed from the bottle.

In addition to these procedures, swabs from skimmers, filters, and drains may also be used for investigations of outbreaks of *Pseudomonas* folliculitis outbreaks involving swimming pools or whirlpools.

3. Collection of water from swimming pools and whirlpools for *Legionella*

a) Sand filters

1) Collect approximately 5 teaspoons of sand from the filter and place in a sterile 200 ml bottle (or two 100 ml bottles) containing sodium thiosulfate.
2) Fill the bottle(s) with water from filter casing to within 1" of the top of the bottle.
3) Indicate on a laboratory requisition "sand filter" for *Legionella* testing.

b) Diatomaceous earth and cartridge filters

1) Consult with the CDS or ESU before collecting these specimens.

4. Swimming pools and whirlpools contaminated with *Cryptosporidium*

Because of the large number of oocysts shed by symptomatic persons and high infectivity of *Cryptosporidium*, even limited fecal contamination could result in sufficient oocyst concentrations in localized areas of a pool to cause additional human infections. Since *Cryptosporidium* oocysts are very small (4-6 T) and resistant to chlorine (The chlorine CT* of 9600 needed to kill *Cryptosporidium* oocysts is approximately 640 times greater than required for *Giardia* cysts), rapid sand filters and recommended chlorine levels commonly used in swimming pools may not be effective in removing *Cryptosporidium* oocysts. However, a well-maintained fine-grade diatomaceous earth (DE) filtration system may remove *Cryptosporidium.*

If the swimming pool is suspected to be fecally contaminated the pool should be closed until the chlorine level and contact time are sufficient to kill *Giardia* cysts. Draining the pool and replacing contaminated filter media in filters are not considered effective against *Cryptosporidium.* Maintaining the high levels chlorine necessary to kill *Cryptosporidium* in swimming pools is not feasible; therefore, such recreational water used should be recognized as a potential increased risk for cryptosporidiosis in immunocompromised persons. In systems that use DE filters, one option may be to close contaminated pools until relatively complete filtration has occurred (typically three turnovers or approximately one day). [1,2]

Pool operators can reduce the risk of initial contamination by following some of the guidelines listed in the ***CRYPTOSPORIDIUM FACT SHEET FOR SWIMMING POOL OPERATORS.***

* CT = Pool chlorine concentration (in parts per million) multiplied by time (in minutes)

1. CDC. Swimming-associated cryptosporidiosis - Los Angeles, County. MMWR 1990;39(20):343-345.
2. CDC. *Cryptosporidium* infections associated with swimming pools - Dane County, Wisconsin, 1993. *MMWR* 1994;43(31):561-563.

5. *Cryptosporidium* fact sheet for swimming pool operators

CRYPTOSPORIDIUM FACT SHEET FOR SWIMMING POOL OPERATORS

Cryptosporidium is a coccidian protozoan found mainly in fecally contaminated environments. One of these environments can be swimming pools. The organism resides in the intestinal tract and is transmitted through the fecal-oral route. The infective dose is very low; as few as 10 oocysts (the infective stage of the organism) have been demonstrated to cause illness. The time between exposure to C*ryptosporidium* and the onset of disease ranges from 1 to 12 days with an average of about 7 days. The most common sign of illness is diarrhea which is usually profuse and watery, often accompanied by abdominal cramping. Malaise, fever, loss of appetite, nausea, and vomiting can also occur.

Oocysts appear in the stool at the onset of symptoms and can continue to be excreted in the stool for several weeks after the symptoms resolve. Outside the body they may be infective for 2-6 months in a moist environment. The oocyst stage is highly resistant to halogen (chlorine/bromine) disinfection. It can withstand relatively high levels of hypochlorous acid for a long period of time. This is a concern in pools where the primary protection against disease transmission is the halogen disinfection system.

Because of the size of the oocysts (2-4 microns in size), they can pass through a sand filter or most cartridge filters. A diatomaceous earth filter can capture most of the oocysts. However, even with good removal it may take as long as 2 ½ days to remove the majority of the oocysts from a pool (assuming a six hour turnover and good capture).

Once the pool is contaminated, the oocysts resistance to halogens and the difficulty of removing the cysts by filtration can result in pools which are contaminated for long periods of time.

Recommendations for training and operating pools

- Provide training for all persons responsible for the maintenance and operation of the swimming pool. Sources of training include state and local health department (LHD) training and the National Swimming Pool Foundation Certified Pool Operator courses.
- Train staff (e.g., lifeguards, instructors) to report illnesses they experience to the management and not to swim if ill with diarrhea or abdominal cramps.
- Maintain the recirculation and filtration equipment to provide maximum filtration. Many pools are periodically overused (e.g., winter weekend usage at many hotels and motels). These pools need filtration equipment that exceeds state required minimums just to maintain normal water quality.
- Maintain chemical feed equipment and chemical levels at optimal levels. This includes maintaining optimal disinfectant levels, pH, total alkalinity, hardness, and temperature. Lack of proper water balance can greatly effect disinfection times.

- Follow recommended disinfection procedures whenever a fecal accident occurs, or whenever it is suspected that the pool may be contaminated by *Cryptosporidium.*
- Develop policies for pool usage by diaper-aged children.
- Provide signage in a conspicuous location before pool entry. The sign might state: *"If you have diarrhea, please do not use the pool", "Shower before entering the pool", "Report illnesses to the management."* Then enforce the rules.
- Use club or organization newsletters to remind patrons not to use the pool if they are or have recently been ill.

Pool disinfection after fecal accidents or with suspected contamination

Our best recommendation for handling fecal accidents is to treat any accident involving unformed stool as a possible *Cryptosporidium* contamination and disinfect accordingly. The following steps need to be taken if a pool is either suspected or is known to be contaminated with *Cryptosporidium*:

a) Close the pool and notify the LHD.
b) Add chlorine to raise the disinfectant residual to 50 ppm. Stabilize the pH to 7.2-7.8 for the chlorine to be effective. (Remember high levels of chlorine can cause a purple interference color when using phenol red to test for pH. If this happens, neutralize the sample with a small amount of sodium thiosulfate.) Run the circulation equipment for 12 hours with the high level of chlorine.
c) Clean and brush down the walls of the pool, skimmers, housings, and skimmer baskets.
d) Backwash the filter thoroughly. If this is a whirlpool, drain the pool at this time.
e) Disinfect the filter.
    - **Sand Filters**: Add a gallon of chlorine bleach (sodium hypochlorite) directly into the filter and let stand 4-6 hours (more may be needed with filters of 36 inch diameter). Backwash again.
    - **Cartridge Filters**: Remove the cartridge and clean the filter casing thoroughly with a 200 ppm solution of chlorine bleach (sodium hypochlorite). Allow to stand several hours. Clean the cartridge thoroughly and soak in a 200 ppm solution of bleach. Rinse and allow to dry completely.
    - **Diatomaceous Earth (D.E.) Filters**: Clean the D.E. off the filters, dispose of the D.E., and soak the tank and septums in a 100 ppm solution of chlorine bleach.
f) Restart the recirculation system and neutralize the chlorine slowly back to normal or fill, if a whirlpool.
g) Balance the water and reopen.
h) Monitor the disinfectant levels carefully.

Additional assistance can be obtained by calling your LHD. For more specific information on this procedure, please call the Environmental Sanitation Unit at (608) 266-2835.

D. Mailing water samples to the laboratory

The testing laboratory should receive the water samples within 48 hours (preferably 24 hours) of collection because old samples may give inaccurate results. Samples should be in transit no longer than 24 hours. Samples that will not arrive at the laboratory within 24 hours of collection should be refrigerated before shipment. Be sure the request form is completely filled out and the sample bottle is placed in a plastic whirl-pak bag (U. S. Post office requirement) before placing it in an insulated mailing container with ice-paks. Take the water sample to the post office and have it processed before the last daily mail dispatch to prevent delay of shipment over a weekend or holiday.

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E. Laboratory (Bacteriological) interpretation for potable water tests

- **Coliform Absent (SAFE).** No coliform bacteria were found in the water sample.
- **Coliform Present (UNSAFE).** Coliform bacteria present in the water sample. The presence of coliform bacteria in a water sample indicates that unfiltered or poorly filtered surface or near-surface waters reached the groundwater or entered through an opening in, around, or at the top of the well casing or some point in the distribution system. This water is a potential health hazard.
- ***E. coli* Present (UNSAFE).** This water has direct evidence of fecal pollution and is a definite health hazard.

APPENDIX H

Boil Water Advisory

DOH POLICY
RESPONSE TO BACTERIOLOGICALLY UNSAFE DRINKING WATER

Water systems which test positive for total coliforms or fecal coliforms may contain pathogenic organisms. The Wisconsin Department of Natural Resources (WDNR) has responsibility for enforcing U.S. Environmental Protection Agency (EPA) requirements for unsafe water systems serving the public and for assisting system operators in the identification and correction of the problem. The DPH has responsibility for assisting local health departments (LHD) in the protection of the public's health.

In 1989, the EPA revised the total coliform regulations under the "Safe Drinking Water Act" which regulates contamination of public drinking water, including bacteriologic contamination. The changes were incorporated into Wisconsin code in March 1991 and are referred to as the "Total Coliform Rule". These changes require more testing and apply more stringent requirements to public drinking water.

Definition of terms used by the EPA and WDNR:

Maximum Contamination Level (MCL) - refers to the maximum amount of any contaminant allowed by the Safe Drinking Water Act. Therefore, an "MCL violation" indicates that the maximum has been exceeded.

Total Coliform Positive - indicates the sample contained the general class of marker organisms referred to collectively as coliform bacteria. These organisms are common in the environment, but should not be in drinking water. A total coliform positive sample indicates that these organisms are in the well or distribution system, or that the sample was contaminated when it was collected. Whenever a water system is total coliform positive the positive samples are further analyzed for fecal coliform and additional samples are collected at the site of the original positive as well as upstream and downstream from the original contaminated sample.

Fecal Coliform / *E. coli* Positive - indicates fecal coliforms normally found in the intestinal tract of warm blooded animals were found in the water sample. Although fecal coliform may not be pathogenic, a fecal coliform positive test is presumptive evidence for fecal contamination of the water.

Monthly MCL Violation - when 5% or more of the samples collected in any month from systems in which at least 40 samples/month are collected or at least two samples from systems in which less than 40 sample/month are collected and are coliform positive (either total or fecal). For monthly MCL violations the WDNR requires water system operators to notify users within 14 days.

Acute MCL Violation - both the original and follow-up (check) samples are total coliform positive **and either** the original or follow-up samples are also positive for **fecal coliform**. These always result

in a "Boil/Bottled Water Notice" and the WDNR will notify the DOH immediately. DOH, in turn, will contact the local health department (LHD) and licensed facilities following the protocol below.

Non-Acute MCL Violation - either a monthly MCL violation or when both the original and follow-up samples are total coliform positive, but neither is positive for fecal coliform. Whether or not a "Boil/Bottled Water Notice" is issued for a non-acute violation is usually the prerogative of the WDNR district office which regulates the water system. Very rarely a monthly MCL violation may result in a "Boil/Bottled Water Notice" if the system was chlorinating when the samples were taken and the district office determines that additional chlorination may not remedy the problem. A total coliform positive may result in a "Boil/Bottled Water Notice" if the water system cannot be chlorinated to a level of 0.5 ppm within 4 hours. Even if the system can be chlorinated adequately within that period, the WDNR will notify the DPH and the DPH will notify the LHD to follow part II of the protocol below.

The following protocol applies to public water systems, both community and noncommunity, determined to be bacteriologically contaminated.

A. When a "Boil/Bottled Water Notice" is issued, the WDNR district office issuing the notice will contact the appropriate DPH regional office immediately by telephone or FAX and report the details of the situation. The DPH regional office staff will report these details by telephone to the staff in the Environmental Sanitation Unit in the DPH central office who will, in turn, notify the Communicable Disease Section and the Bureau Director's Office. The Bureau Director's Office will notify the Division Administrator's Office if warranted. The DPH regional office staff, with assistance from central office staff as necessary will:

1. Contact the LHD of the city and/or county:

a) Inform them of "Boil/Bottled Water Notice" and ask that they heighten surveillance for waterborne diseases in the community affected.

b) Inform LHD staff that DPH will contact establishments (or assist them if they are an agent health department) if the number of establishments involved is manageable or coordinate a media release with WDNR staff if there are a large number of establishments involved; this release must include instructions for commercial establishments informing them that ice and water served to the public must be purchased from an approved source; commercial establishments are not to use boiled water (the quantity they need precludes a safe boil/cool procedure).

c) Assist LHDs with information to instruct callers:

1) Use bottled water or boil tap water for five minutes before using it for drinking, cooking, making baby formula, coffee, juices, other beverages or bathing infants.

2) Throw out ice cubes in their freezer and use commercial ice.

3) Do not brush teeth with unboiled tap water.

4) Do not wash open wounds with unboiled tap water.
5) Water is safe for bathing (except infants), showering, washing hands, and washing dishes if the final rinse is boiled water. Automatic dishwashers that heat-dry the dishes may be used safely.

d) LHD should notify the following agencies. The order of contact is a local decision and should be based on relative risk and local emergency plans.

1) Hospitals and other health care facilities:
   - Inform staff and patients.
   - Provide bottled water for ingestion.
   - Use sterile water for flushing wounds, bottled water for surgical scrub, tube feeding, washing newborns, etc.
   - Report all suspected waterborne disease to LHD immediately.
2) Medical and Dental Clinics:
   - Use bottled water for ingestion, sterile flushing of wounds, etc.
   - Dentists and dental hygienists discontinue use of water cooled instruments such as high-speed handpieces, air/water syringes, and cavitrons; substitute bottled water applied with a bulb syringe for cooling and rinsing purposes; use rubber dams as appropriate; defer treatment for patients who may be at risk, such as small children, the elderly, and those with chronic diseases and/or suppressed immune systems.
   - Report all suspected waterborne disease to LHD immediately.
3) Schools and day care centers:
   - Inform staff and students of problem.
   - Turn off drinking fountains, provide commercially bottled water for ingestion.
   - Report all cases of waterborne disease to LHD immediately.
4) Jails:
   - Provide commercially bottled water for ingestion.
   - Report all cases of waterborne disease to LHD immediately.
5) Local Emergency Government:
   - Explain nature of problem.
   - Review WDNR, DPH and LHD roles.

2. Contact food service facilities and instruct:

a) Water supply has tested "unsafe" - may contain harmful bacteria.
b) Use only commercially bottled water for ingestion, washing vegetables, making coffee, cooking, reconstituting juices or other drinks and any other use which might result in the ingestion of unboiled tap water.
c) Dump ice if made on location - purchase ice from safe source, clean and sanitize ice machine, following manufacturers instructions, after "all clear" has been issued by WDNR before making ice again.

d) Turn off all post-mix beverage machines, dump pre-mixed beverages on hand (e.g., juice, lemonade, coffee).
e) Turn off beverage vending machines using community water supply.
f) Post sign in restroom that instructs not to drink water or use for mixing baby formula.
g) Utensil washing: be sure to use proper procedure:
   - Manually: wash-rinse-sanitize following label directions on sanitizer.
   - Dishwashers: 190° F hot water sanitizing or chemical sanitizer according to directions on sanitizer.
h) Use single service gloves for food preparation requiring extensive handling
   Remember: Gloves are not a substitute for thorough hand washing!
i) These procedures are in effect until "all clear" is given by WDNR.

3. Contact hotels, motels, and instruct:

a) Post signs that instruct not to drink water or use for making coffee, brushing teeth, making baby formula or bathing infants.
b) Buy commercially bottled water for ingestion.
c) Dump ice if made on location-purchase ice from safe source, clean and sanitize ice machine after "all clear" has been issued by WDNR before making ice again.

4. Contact vending machine operators.

5. Contact the Bureau of Quality Assurance (BQA) if facilities they license may be affected.

B. When WDNR issues an "Unsafe Water Alert" but not a "Boil/Bottled Water Notice" (i.e, system can be chlorinated within 4 hours) DPH regional staff, with assistance from BPH central office staff if necessary, will:

1. Contact LHD:

a) Inform them of problem and explain difference from "Boil/Bottled Water Notice" situation.
b) Inform them DPH/BCD will contact establishments (or assist them if they are an agent health department) if the number of establishments is manageable or coordinate a media release with WDNR if there are a large number of establishments involved.

2. Contact restaurants and hotels/motels:

a) Inform them of the problem and explain the difference from "Boil/Bottled Water Notice" situation.
b) Dump ice. Clean and sanitize ice machine, reuse only after water system is chlorinated.
c) Dump pre-mixed beverages (e.g., juice, lemonade)
d) Until water has been safely chlorinated:
   - Use commercially bottled water.

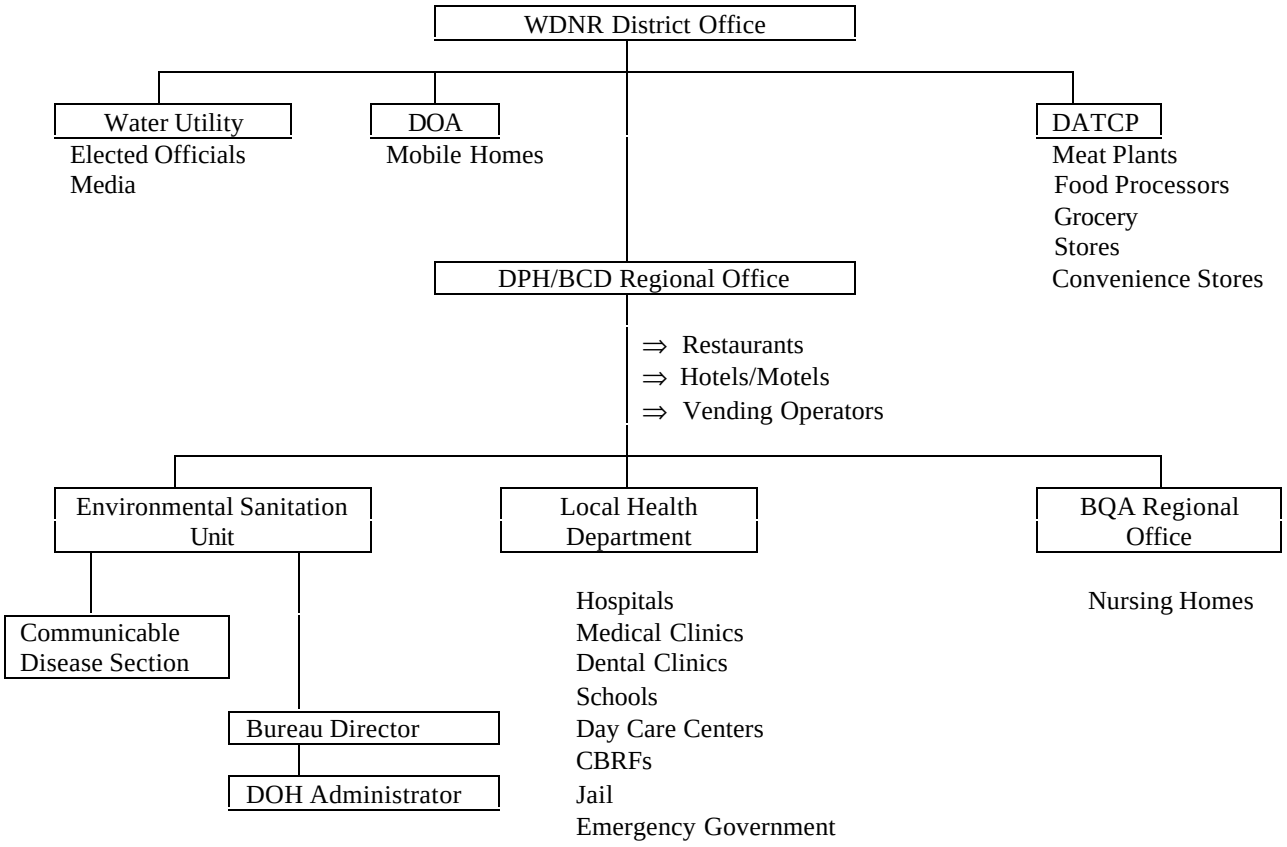
- Turn off all post mix beverage machines.

e) Be sure to use proper utensil washing procedure.

C. "All Clear" procedure for both "Boil Water" and Unsafe Water" situations:

WDNR will notify the system operator and the DPH and the DPH will notify the LHD. Water system users will be notified by the media and through community word-of-mouth.

Figure 10 . Hierarchy of information distribution system regarding "Bottled/Boiled water" notices.



APPENDIX I

Public Health Concerns Following Natural Disasters

A. Floods

Floods can be physically devastating as well as a threat to public health through contaminated water or food. In the case of municipal water supplies, the WDNR will make a public announcement in the event there is a "boil water advisory". When flood waters rise above the well casing, a private well owner should assume that the well has been contaminated. Private well owners should refrain from using water from flooded wells until the flood waters have receded and the well can be disinfected and tested. Water can be safely used if it is brought to a rolling boil for one minute before drinking, washing, brushing teeth, or cooking. Wells should be disinfected following the procedures listed in Appendix G , *Collecting Water Samples*. For additional information regarding safety issues following floods, consult the CDC brochure on the Internet entitled *"A Prevention Guide to Promote Your Personal Health and Safety"* (See *References and web sites*, page 36).

B. Guidelines for the re-opening of food service establishments following disasters.

Due to the unpredictable, sporadic occurrence of natural disasters (e.g., tornadoes, blizzards, floods) or accidental catastrophes (e.g., explosions, fires, chemical poisonings) or contamination of water, and/or food supplies, the LHD and DHFS may become involved with emergency procedures especially regarding reestablishing a safe, adequate, and available food and water supply. In any disaster or accident situation, your own safety should be considered. High water, gas leaks, fallen electrical lines, damaged buildings, falling rubble, collected sewage and similar conditions are potentially very dangerous; therefore safety precautions should be observed.

Local and regional sanitarians may be called upon to evaluate the sanitary conditions for food service establishments following such disasters or accidents. To insure that conditions are safe as well as sanitary before reopening food service establishments, the sanitarian should evaluate the following:

1. Governmental coordination

Coordination with other local, state, and possible federal agencies may be necessary in establishing individual responsibilities. Agencies may include: DHFS/DPH/BCD for investigation, consultation, epidemiological implications; DATCP/Food Safety and Inspection Bureau and the U.S. Food and Drug Administration for consultation regarding commercial food items; or the USDA to aid in salvaging, disposition, reconditioning, disposal of foods, etc.

Local fire or police departments may be needed to prevent looting of damaged or nonsalvageable food supplies. Utility companies may need to be contacted to prevent possible gas explosions or to remove fallen electrical lines.

2. Preliminary survey following a disaster

Conduct a preliminary survey of the food establishment to determine the extent of the damage. If the electricity was off, determine how long it has been off and when it will be returned to service.

In case of a fire, determine if the water used to extinguish the fire came from a potable water source and what chemicals may have been used to extinguish the fire. The fire department may also have knowledge of the various temperatures reached in different areas of the premises. Find out what toxic gases and gases from other combustibles, plastics, etc., were present in the air. These vapors can penetrate foods and food containers and contaminate the contents.

3. Merchandise that should be destroyed and cannot be reconditioned or salvaged.

- **Produce** such as lettuce, celery, cabbage, etc., that has been under flood water or exposed to contaminants.
- Potentially hazardous **food under refrigeration** if temperatures have reached 50^{o} F or greater for more than one hour. These may include meats, butter, cheese, milk, milk products, fish and shellfish.
- **Heat-damaged food** items that were charred or were in the immediate proximity to a fire. Extreme heat can cook contents of canned goods and adversely affect the contents.
- **Foods subjected to direct contact with nonpotable water:** Paper, or cellophane wrapped goods can collect filth or split at the seams making it virtually impossible to remove dirt or to properly sanitize. These may include coffee, tea, flour, meal, cereals, grains, sugar, or nuts in bags or open containers. Also, consider items such as candies, breads, cakes and packaged foods like chewing gum and mints.
- **Screw top, crimped-cap and similar containers** including soft drinks, beer, wine, liquor bottles should be discarded.
- **Frozen foods** with internal core product temperatures higher than 10^{o} F or foods intended to be frozen cannot be salvaged.
- **All eggs**, shell whole, uncracked, while stored exposed or in cardboard containers, shall be discarded.
- **Foods in glass containers** and bottled foods with cork stoppers shall be destroyed whether the original seal has been broken or not. No type of closure used on glass food containers has been found safe for submersion in flood waters.
- **Smoke damage to foods** is the most difficult to assess. Insoluble tars, adhesives in wall coverings and flooring, plastics, their by-products, and other toxics may be suspended in the smoke and are a major health concern. All meats exposed to smoke shall be disposed of whether wrapped in cellophane, aluminum foil, or paper. Look for soot or ash on/under containers, lids, or tops. Oil products such as butter readily absorb smoke with a resultant bad taste and odor. All friction-type closures and cellophane wrapped products affected by smoke are not salvageable. Produce wrapped in cellophane is a perishable product and should not be salvaged.

- **All meats**, beef, pork, poultry, fish, shellfish, etc. (except canned) cannot be salvaged for human consumption. Discuss with DATCP or USDA what might be used for animal rendering.
- **Miscellaneous foods**, such as bakery, ice cream, condiments, etc. should be discarded.
- **Spices**, subject to high temperatures or water contamination should be discarded.

Consider the effects of chemicals used in fire fighting, the effects of explosions and bottle damage, and the effects of insecticides, rodenticides and household cleaning compounds. Remember:
ALL WATER DAMAGED GOODS SHOULD BE CONSIDERED CONTAMINATED.

4. Reconditioning:

- In flood conditions, **hermetically sealed canned foods**, if intact and not subject to heat, may be salvaged for human consumption if the cans are thoroughly scrubbed, washed, rinsed and sanitized using hot potable water, soap and sanitizer (15 minute immersion). A bleach solution (200 ppm) is recommended for the sanitizer. Other sanitizers may be used. Procedures similar to manual dishwashing should be set up for this activity. Any individual handling sewage-contaminated objects should be wearing heavy duty plastic gloves. The labels must be removed, and the cans must be in good repair (e.g., no openings, dents, bulging). Cans should be air dried. Relabel contents of cans.
- Reusable equipment, utensils, pots, pans, silverware, etc., if not physically damaged, must be thoroughly washed, rinsed and sanitized using the same procedure as mentioned above.

See DATCP policy for the handling, reconditioning, condemnation of distressed food and alcoholic beverages.

5. Reinspection

- No food service or food handling operation should be permitted to operate until the premises are determined to be safe and fit for human occupancy by the local fire marshall and state or local building inspector. Written verification of such determination shall be obtained.
- No food service activity shall take place until the entire premises, including all equipment, have been thoroughly cleaned, disinfected and dried. The environment of exposed food, the kitchen and all related areas shall comply with all applicable sections of Wisconsin Administrative Code HSS 196 Restaurants.
- Dining furnishings shall be appropriately cleaned and disinfected.
- A safe water supply shall be confirmed (written laboratory results, bacterial, chemical, if applicable) and approved prior to re-establishment. The interior water system should be activated and allowed to flush before being used as a potable supply for coffee makers, ice machines, dishwashing, etc.

- All plumbing, heating, electrical and gas powered equipment shall be tested and in good working order before re-establishment (including toilet room fixtures, all water sources and drains). Electrical inspector may be called to verify (in writing) safety.
- Ice machines shall be thoroughly disassembled, cleaned, flushed and sanitized before allowed to be reconnected to the interior water supply.

IMPORTANT: All items that are questionable should be placed aside for detention. It is not the responsibility of the sanitarian or investigator to recondition or segregate the contaminated merchandise. It is the sanitarian's responsibility to make sure that such contaminated foods and supplies are not used for public consumption.

The food service operator is advised to maintain a detailed log of all materials and food items discarded or removed for the purpose of verifying loss. The operator often needs this information for insurance and tax purposes, health official investigations, and possibly to support testimony in a court of law.

APPENDIX J

Outbreak Investigation at a Recreational or Educational Camp

A. Definition of recreational or educational camp:

"A premises, including temporary and permanent structures, which is operated as an overnight living quarters where both food and lodging or facilities for food and lodging are provided for children or adults, or both children and adults, for a period which includes 4 or more consecutive nights of lodging, for a planned program of recreation or education, and is offered free of charge or for payment of a fee by a person or by the state or local unit of government.") HSS 175.03 (3)

B. Camp exposures

Individuals who attend recreational or educational camps may be at increased risk of gastrointestinal illness associated with food or water or skin infections associated with exposure to contaminated recreational water (e.g. "swimmers itch"). Food temperature abuse, improper sanitation of eating utensils, poor personal hygiene, inadequately trained food workers, contaminated recreational water, or inadequate maintenance of septic systems and wells may contribute to increases in illness among campers.

C. Camp outbreak investigation

This section contains steps in addition to those found in Section IV, *Steps in Investigating an Outbreak* that apply to the investigation of foodborne or waterborne outbreaks at recreational or educational camps only.

1. Planning a detailed epidemiologic investigation

a) Assure stool culture kits, ova and parasite kits, and sterile bottles for collecting water samples are readily available. If samples are collected from a chlorinated water source (pool, spas, and drinking water), the sterile bottles should contain sodium thiosulfate to neutralize the chlorine.

b) Arrange for an on-site inspection of the camp by the sanitarian and/or the public health nurse as soon as possible after being notified of the possible outbreak.

c) Obtain a map of the camp and identify the following:
   - Specific camping areas including tent and cabin sites and common areas such as toilets, dining areas, swimming areas and other recreational areas
   - Location of wells and septic areas
   - List of campers and staff assigned to each tent or cabin
   - Plot ill cases on the map to identify a possible cluster of illness

d) Obtain the previous biological tests of the potable water supply if a well is utilized.

e) Consider collecting a water sample from the well(s) and test for total coliforms.

f) Obtain a schedule of recreational activities at the camp including overnight camping trips which may have occurred at locations other than the camp.

2. Establishing the existence of an outbreak

a) Interview the camp health supervisor regarding the occurrence, signs and symptoms and the severity of the illness among the campers and the staff.

b) Check the health and treatment records kept at each camp.

3. Formulate a tentative hypothesis

Formulate a tentative hypothesis to explain the likely cause, source and distribution of the illness. The hypothesis will be based on the data currently known regarding the symptoms and possible incubation periods of various pathogens, and common exposures of ill individuals. The hypothesis may change when additional data are collected.

Example:

The LHD receives a call from a staff worker at a recreational camp. The staff persons states that at least 15 campers and staff become ill within a 12 hour period. Symptoms include severe abdominal cramps and diarrhea. The 15 ill individuals had all attended an outdoor barbecue two days before the onset of the illness. The staff person stated that a chicken dinner was prepared by the campers at the barbecue and may have been undercooked.

Tentative hypothesis: Foodborne outbreak from undercooked chicken, with the likely cause being *Campylobacter* or *Salmonella*.

Part of the investigation included a review of the health care records which indicated that none of the 15 ill individuals had a fever when seen at the camp health center. A further review of the activity schedule at the camp indicated that the ill individuals were part of a group that had taken a wilderness hike 4 days before the onset of illness. The counselor allowed them to swim in a pond which is 100 feet from a farm field that had recently been fertilized. The day before the campers swam in the pond the area received over an inch of rain.

Revised tentative hypothesis: Exposure to contaminated recreational water, with the likely cause being *E. coli* O157:H7.

4. Put control measures into operation

Control measures are based on the available data and the tentative hypothesis of the cause of the illness. To determine effective control measures it must be determined who, when and where individuals may have been , how the illness was transmitted and what the etiologic agent may be.

Using the example above, when the tentative hypothesis of undercooked chicken was the cause of the illness, it would be appropriate to advise that anyone with active diarrhea not be allowed to prepare meals and the preparation of dinners be closely supervised by staff to assure the meat is thoroughly cooked. When the hypothesis changed the control measures may include suspending any recreational water activities until laboratory tests indicate the water is safe.

5. Confirm or refute hypothesis (See *IV. Steps in an outbreak investigations)*

APPENDIX K

Statement Regarding Fee Exempt Testing

APPENDIX L

"Tips toward a safer kitchen"

" TIPS TOWARD A SAFER KITCHEN"

- Keep your refrigerator at 40^{o} F (4^{o} C) or less. A temperature of 40^{o} F or less slows the growth of most bacteria. The fewer bacteria there are, the less likely you are to get sick from them.

- Wash your cutting board with soap and hot water after each use. Never allow raw meat, poultry, and fish to come in contact with other foods. Washing with only a damp cloth will not remove bacteria. Periodically washing in a bleach solution is the best way to prevent bacteria from remaining on your cutting board.

- Cook ground beef, red meats and poultry products until they are no longer red in the middle. Make sure the juices run clear. Cooking food, including ground meat patties, to an internal temperature of at least 160^{o} F (72^{o} C) usually protects against foodborne illness (i.e., well done meats). Ground beef can be contaminated with potentially dangerous *E. coli* 0157:H7 bacteria. The USDA Food Safety and Inspection Service (FSIS) has recommended the use of a meat thermometer when cooking hamburger. Do not rely on the internal color of the meat because some ground beef may turn prematurely brown before a safe internal temperature of 160^{o} F is reached.

- Do not eat raw or lightly cooked eggs. Many older cookbooks have recipes that call for raw eggs (e.g., ice cream, mayonnaise, eggnog). These recipes are no longer recommended because of the risk of *Salmonella*. The commercial versions of these products are made with pasteurized eggs and are not a food hazard.

- Discard cracked or dirty eggs.

- Keep eggs refrigerated and eat promptly after cooking. Do not keep eggs, or egg-based foods or sauces warm for more than two hours.

- Always wash fruits and vegetables thoroughly before cutting or eating.

- Wash hands with soap warm water immediately after handling raw meat, raw eggs, poultry, or fish. Wash for at least 20 seconds before and after handling food, especially raw meat. If you have an infection or cut on your hands, wear rubber or plastic gloves.

- Defrost meat, poultry and fish products in the refrigerator, microwave oven, or cold water changed every 30 minutes. Follow package directions for thawing foods in the microwave. Cook microwave-defrosted food immediately after thawing. Changing water every 30 minutes when thawing foods in cold water ensures the food is kept cold, an important step in slowing bacterial growth on the outside while the inner areas are still thawing.

- Use clean cooking utensils, silverware and dishes to prepare and serve all foods. Be especially careful when barbecuing, as one spatula or platter often touches both raw and uncooked meats.

- If possible, use clean utensils instead of hands to prepare food.

- Refrigerate cooked, perishable food as soon as possible within two hours after cooking. Date leftovers so they can be used within two to three days. *"If in doubt, throw it out!"*
- Sanitize your kitchen dishcloths and sponges regularly. Wash with a solution of one teaspoon chlorine bleach to one quart water, or use a commercial sanitizing agent, following product directions.

Cloths and sponges used for cleaning utensils should be replaced or disinfected daily. Paper towels are preferred.

- Clean kitchen counters and other surfaces that come in contact with food using hot water and detergent or a solution of bleach and water. Keep sponges and dishcloths clean because, when wet, these materials harbor bacteria and may encourage their growth. Bleach and commercial disinfectants are best for getting rid of bacteria. Hot water and detergent do a good job, too, but may not kill all strains of bacteria.

- Allow dishes an utensils to air-dry to eliminate re-contamination from hands or towels. When washing dishes by hand, it's best to wash them all within two hours -- before bacteria can begin to form.

- Dented cans should be used as soon as possible; better yet, don't buy them. Toxins from the can get into the food.

- Do not store onions and potatoes together because gases from onions make potatoes rot.

- Do not store foods under sinks because it might get tainted by cleaning supplies or water.

- Do not save leftover food or milk that a baby does not finish.

- If foods such as sandwich meats feel slimy, it is because they are coated in bacteria. Throw the food out, or if you just bought it, return it to the store and inform the manager.

- Flour bugs might be repulsive, but they probably will not make you sick. Insects such as flies and cockroaches can spread bacteria.

- Accumulated paper and grocery bags can be hangouts for rodents and bugs.

- Do not put things that are handled a lot but not washed (e.g., playing cards) in the same drawer as utensils.

- **Do not cook for others if you are ill!**

Source: Iowa State University, Madison Department of Public Health

APPENDIX M

"Hand washing"

Disease Fact Sheet Series **Hand washing**

(Adapted from the Disease Fact Sheet Series)

Why is hand washing important?

Hand washing, when done correctly, is the single most effective way to prevent the spread of communicable diseases. Good hand washing technique is easy to learn and can significantly reduce the spread of infectious diseases among both children and adults.

What types of disease can good hand washing prevent?

1. Diseases spread through fecal-oral transmission. Infections which may be transmitted through this route include salmonellosis, shigellosis, hepatitis A, giardiasis, enterovirus, amebiasis, and campylobacteriosis. Because these diseases are spread through the ingestion of even the tiniest particles of fecal material, hand washing after using the toilet can not be over-emphasized.
2. Diseases spread through indirect contact with respiratory secretions. Microorganisms which may be transmitted through this route include influenza, streptococcus, respiratory syncytial virus (RSV) and the common cold. Because these diseases may be spread indirectly by hands freshly soiled by respiratory discharges of infected people, illness may be avoided by washing hands after coughing or sneezing and after shaking hands with an individual who has been coughing or sneezing.
3. Diseases may also be spread when hands are contaminated with urine, saliva or other moist body substances. Microorganisms which may be transmitted by one or more of these substances include cytomegalovirus, typhoid, staphylococcal organisms, and Epstein-Barr virus. These germs may be transmitted from person-to-person or indirectly by contamination of food or on inanimate objects such as toys.

What is good hand washing technique?

There is more to hand washing than you think! By rubbing your hands vigorously with soapy water, you pull the dirt and the oily soils free from your skin. The soap lather suspends both the dirt and germs trapped inside and are then quickly washed away.

Follow these four simple steps in keeping hands clean:

1. Wet your hands with warm running water.
2. Add soap, then rub your hands together, making a soapy lather. Do this away from the running water for at least 10 seconds, being careful not to wash the lather away. Wash the front and back of your hands, as well as between your fingers and under your nails.
3. Rinse your hands well under warm running water. Let the water run back into the sink, not down to your elbows. Turn off the water with a paper towel and dispose in a proper receptacle.
4. Dry hands thoroughly with a clean towel.

(Over)

What type of soap should be used?

Any type of soap may be used. However, bar soap should be kept in a self draining holder that is cleaned thoroughly before new bars are put out and liquid soap containers (which must be used in day care centers) should be used until empty and cleaned before refilling.

To prevent chapping use a mild soap with warm water; pat rather than rub hands dry; and apply lotion liberally and frequently.

What are some mistakes I should avoid regarding hand washing?

- DON'T use a single damp cloth to wash a group of children's hands.
- DON'T use a standing basin of water to rinse hands.
- DON'T use a common hand towel. Always use disposable towels in day care of food preparation settings.
- DON'T use sponges or non-disposable cleaning clothes unless you launder them on a regular basis, adding chlorine bleach to the wash water. Remember that germs thrive on moist surfaces!

What are some ways to help children with good hand washing technique?

It is important to encourage and help children to wash hands before eating, after playing outdoors or playing with pets, after using the bathroom, and after blowing their noses. Even though hands may appear to be clean, they may carry germs or microorganisms that are capable of causing disease.

Don't assume that children know how to wash their hands properly. Supervision, especially in a day care setting, is an essential element in forming good hand washing habits in children.

Finally, children learn by example! Let them observe good hand washing technique from the adults who care for them.

APPENDIX N

Outbreak Report Forms

LIST OF FOLLOW-UP OUTBREAK INVESTIGATION FORMS

DPH 4142 **Food or Waterborne Outbreak of Gastrointestinal Diseases - Survey Questionnaire**

This form has been designed to obtain indivisual illness, food and drink histories for cases and controls in outbreak situations. These individual histories are for LHD use in investigating the outbreak and should not be sent to the CDS / BPH.

DPH 9081 (CDC 52.13) **Investigation of a Foodborne Outbreak**

This is a summary report form to be completed at the end of the FBO investigation. This form should be completed for every FBO or suspect FBO and submitted along with any narrative and sanitarian's report to the CDS / BCD.

DPH 9213 (CDC 52.12) **Investigation of a Waterborne Outbreak**

This is a summary report form to be completed at the end of the WBO investigation. This form should be completed for every WBO or suspect WBO and submitted along with any narrative and sanitarian's/engineer's report to the CDS / BCD.

DPH 4151 **Acute and Communicable Diseases Case Report**

This form should be completed for each individual case of a reportable disease (Each reportable disease is listed on the back of the DPH 4151 form.)

WSLH M-94-1a **Food Sample Requisition Form**

This requisition form should be used for submission of food specimens to the WSLH.